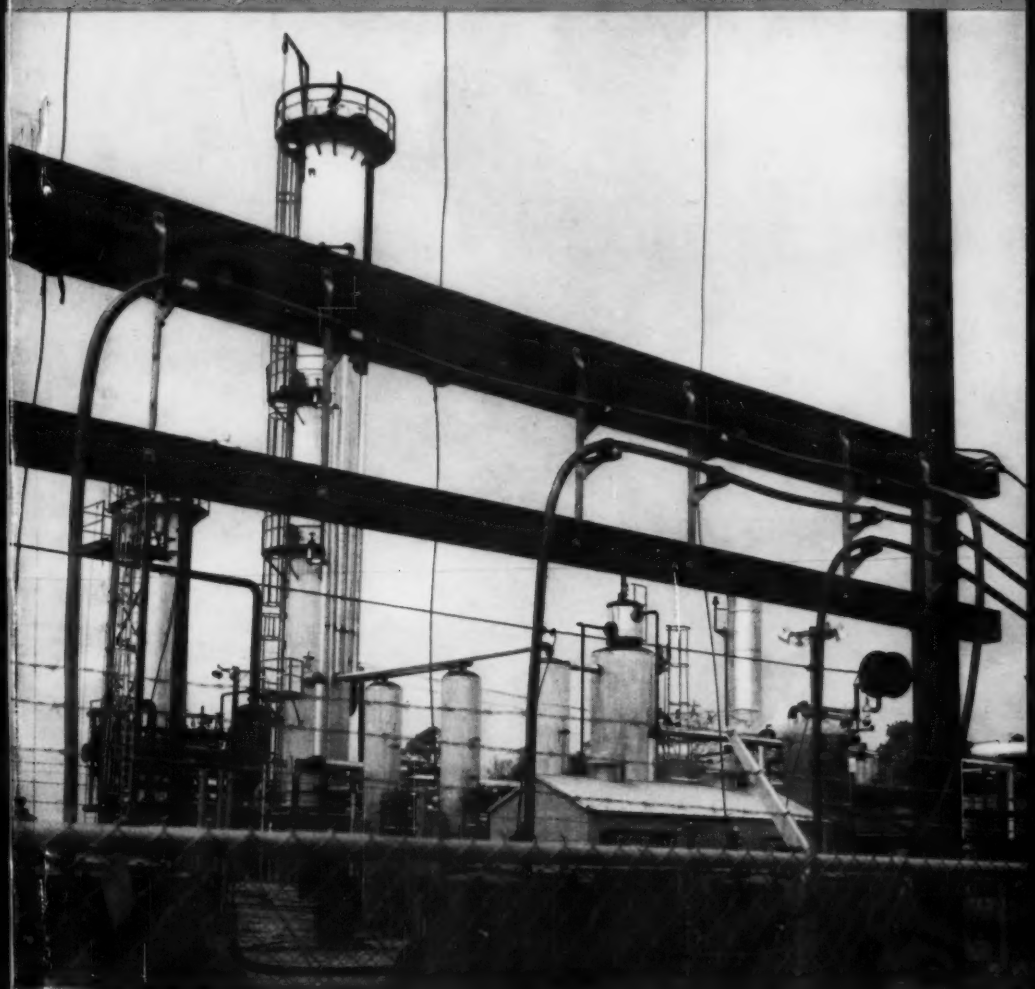
The Electrical Industry's Weekly Magazine

April 27, 1959

Electrical World

Price 50 Cents

A McGraw-Hill Publication



Improved Methods Cut Industrial Substation Costs...

...page 56

Beginning in this issue, a new section

Procurement & Products

. . . designed for those who must specify equipment, plan, manage, and perform the buying functions for electric utilities . . . . . page 70

Also see Publishers Column . . . page 5

Let Texaco help you achieve LOWER COST PER Kwhr

Texaco's long experience in dealing with every phase of power plant lubrication has resulted in a series of lubricants designed to meet the special problems encountered by electrical system engineers. Furthermore, Texaco Lubrication Engineers are always available to lend their special skills in routine as well as emergency situations. Let them help you keep your cost per Kwhr low.

Here's what you get when you specify Texaco:

1. **Special lubricants for:**
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2. **Experienced engineering service:**

   Texaco Lubrication Engineers are thoroughly familiar with all phases of power plant lubrication.

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For more information on Texaco's complete power plant service, contact your nearest Texaco Distributing Plant, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Electrical World

Vol. 151, No. 17 APRIL 27, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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CURRENT EVENTS

Wage Contracts Indicate a 4 to 4½% Average

Early '59 agreements between unions and electric companies are slightly below last year's 5% average increases. p 44

Electric Vehicles: Foreign Reaction Is Cool

Britain, however, has about 28,000 trucks in operation and Mexican business men are enchanted with the idea... p 46

INDUSTRIAL

Improved Methods Cut Industrial Subs Costs

W. W. Trimmier, Houston Lighting & Power Co

New design saves from $250 to $550 per installation depending on number of secondary connections..... p 56

MEETINGS

Highlights of Southeastern Exchange Meet

Problems of growth, financing, sales discussed by top industry men at annual Boca Raton conference..... p 49

American Power Conference Hears Vogel

TVA head says public-private fight is wasteful. Technical advances told. Russians reveal transmission plans..... p 50

PROCUREMENT

Procurement & Products News

Leadoff newsletter in section brings latest items on prices, orders, commodities, fleets, and purchasing meeting..... p 70

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As the power goes . . . so go the operating costs at Intermountain Chemical Co.'s highly mechanized mining and refining operation. And every bit of this power—for digging, hoisting and processing of the ore—comes from Intermountain's power plant through 5kv non-shielded Okolite-Okoprene self-supporting aerial cables. They needed utmost dependability—and got it!

Heavy concentration of corrosive soda ash dust and severe environmental conditions have no effect at all on this aerial cable. Note the simple, low-cost support pole—no cross-arms needed—as well as the easy installation and splicing procedures used for this light weight, unshielded 5kv cable.

Okolite-Okoprene Aerial Cables withstand chemical contamination ...assure continuous production at Intermountain

"These 5,000-volt aerial cables have withstood heavy concentrations of soda ash dust for eight years now," says Louis Ruffini, staff assistant to the maintenance superintendent for Intermountain Chemical Company of Wyoming. "They've proved to be invulnerable to temperatures as low as —40°F and as high as 120°. They've faced winds up to 70 mph, and they tested perfectly at 40,000 volts d-c. We expect them to be around a long time yet."

These facts are vital to Intermountain. The company depends almost completely on electrical power to mine trona ore and refine it into almost half a million tons of soda ash per year. That's why they stress the dependability of their Okolite-Okoprene, 3/c, self-supporting power cables with aluminum conductors, cables that distribute power to every sub-station in the mine and processing plant.

"Installation of the aerial cables was very simple," says Mr. Ruffini, "thanks to their flexibility, light weight, and self-supported Dualay construction . . . and due also to the unshielded 5,000-volt construction that permitted the simplest of splicing and terminating procedures."

For *your* power needs, this construction can offer installation and operating economies, combined with long-term dependability. Okolite insulation has a 30-year record of service, maintaining in severest installation conditions its high dielectric strength and great resistance to corona cutting, moisture and heat. Okoprene sheath offers unusual protection against weather, abrasion, ozone, heat, cold, many acids, alkalies and chemicals. Application by the strip process of both insulation and sheath is the final assurance of matchless performance and long life. For the Okolite-Okoprene self-supporting aerial cable that best suits your needs, see 56-page Bulletin EW-1074. It's free . . . just write The Okonite Company, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

6216

Procurement & Product News

Serving our readers' needs and providing the information in an easy-to-find and readable way is a fundamental activity of editors. That is why we perforate all pages, summarize each issue, write and illustrate material for speedy comprehension.

Constantly changing emphasis to keep in tune with the times is part and parcel of this editorial activity. This latter policy has led us to a change in emphasis in this issue that appears as "Procurement and Product News."

Most of our editorial material relates to the supply and application of equipment and services for the electrical industry. But we realize that certain material is more specifically directed toward the procurement and product characteristics area.

For this reason we are inaugurating a new section dedicated more directly to this area where readers can find the latest information which is pertinent for those responsible for selection and procurement of manufacturers' products. This section includes a newsletter, specific news on suppliers, new lines of equipment, new products, new design information and related material. The new section begins on page 70.

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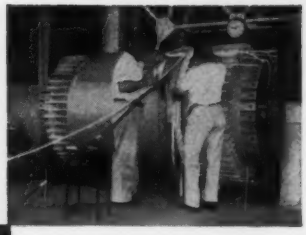
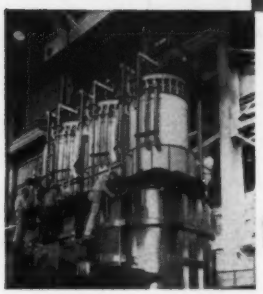
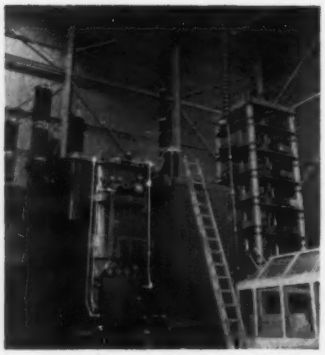




OF SKILL AND FACILITIES

Moloney's growth has paralleled that of the electric industry. This growth has been possible because of experience and know-how, skill and facilities . . . all backed by constant research and development programs which have sparked many industry firsts.

Moloney carefully studies industry trends, and utility needs are anticipated whenever possible. Co-operative development between Moloney and their customers is constant in both specific and industry-wide instances.

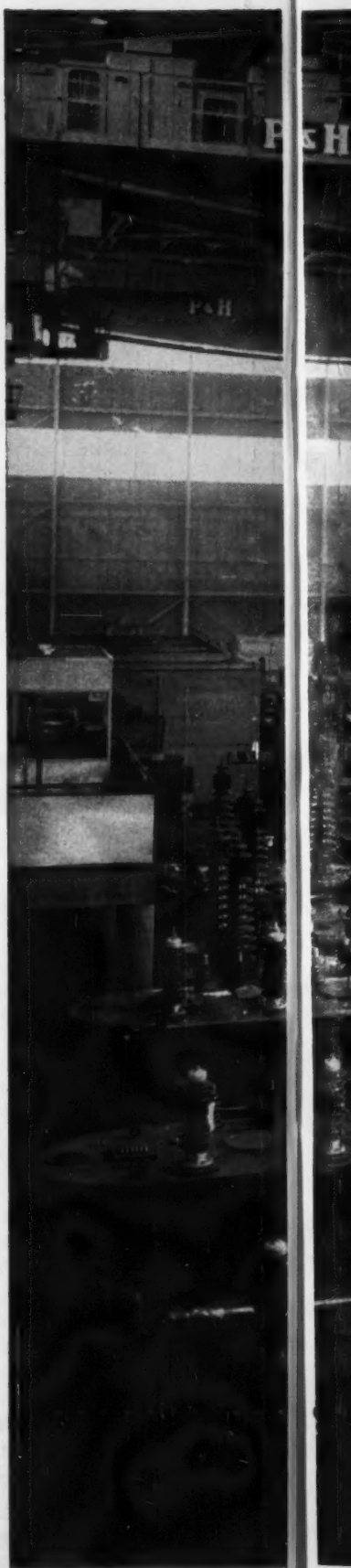


Skill and Facilities to manufacture large transformers of any type or size required . . . over sixty years experience in the manufacture of transformers . . . continuous product improvement . . . proven service records on utility systems throughout the country . . . are all good reasons for specifying Moloney Transformers . . . All Along the Line.

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

ME58-24



SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

MOLONEY
ELECTRIC

72 tons of *FLY ASH* collected a day!

GREEN'S AERODYNE HELPS SOLVE CONSOLIDATED EDISON'S FLY ASH PROBLEM

Installation of Aerodyne Units at Consolidated Edison's Hell Gate Electric Generating Station.

Green makes this AERODYNE mechanical dust collector, to collect fly ash and other dusts. Does this Green AERODYNE really work?

Well, let's quote a few words from Mr. J. J. Grob, Chief Performance Engineer, Mechanical Engineering Department, Consolidated Edison Company of New York, Inc.

QUOTE 1
Why used • • • • • • • • • • • • • • • "At Hell Gate Station two Aerodyne mechanical collectors were installed in the uptake flues of boilers No. 11 and 12 for removing the bulk of fly ash leaving the furnaces."

QUOTE 2
72 tons of fly ash per day • • • • • • "The furnaces are slag tap and, of that ash which would otherwise be expelled to the electrostatic precipitators before entering the stack, the Aerodyne units, based on careful tests, remove approximately 72 tons of fly ash per day."

QUOTE 3
Satisfactory • • • • • • • • • • • • • "The operation of the Aerodyne mechanical collectors has been satisfactory and the life of the cones has greatly exceeded expectations."

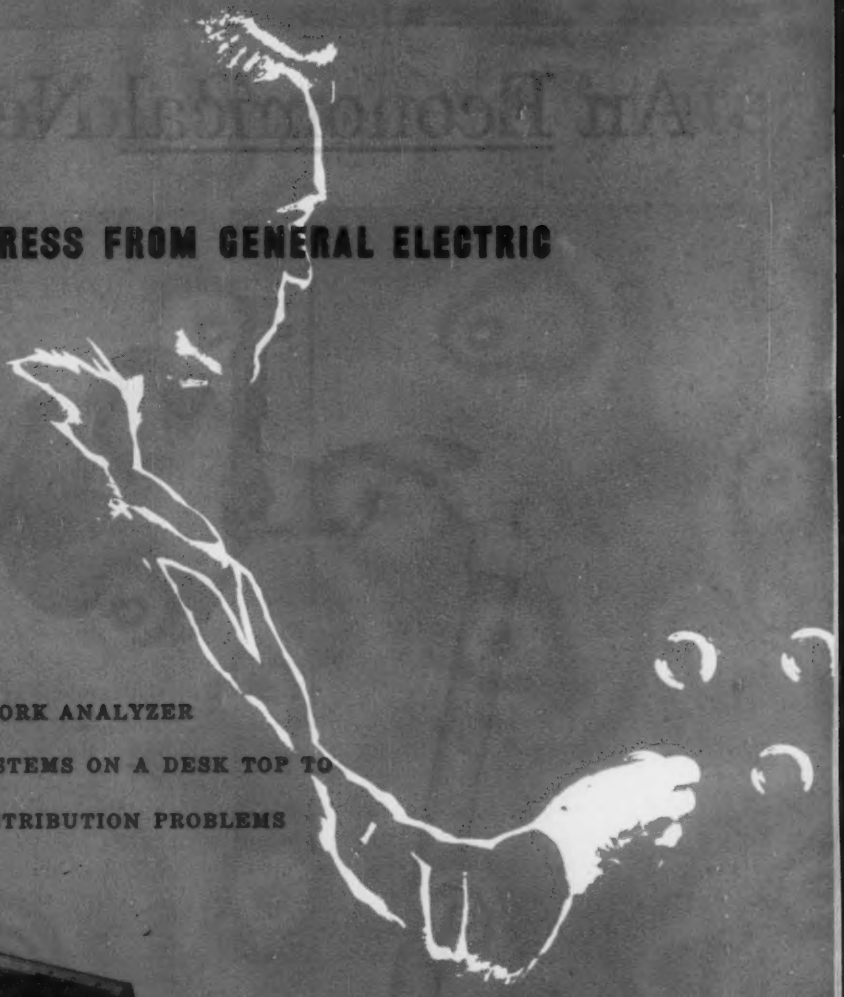
We repeat, in all modesty — Green can help you solve FLY ASH and DUST collection problems.

Why not write and ask us?

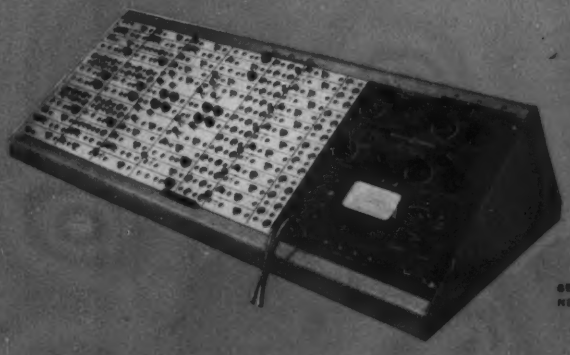
Green

THE GREEN FUEL ECONOMIZER CO., INC. **BEACON 3, NEW YORK**

COMPUTER PROGRESS FROM GENERAL ELECTRIC



GE 307 MINIATURIZED AC NETWORK ANALYZER SIMULATES 4-STATION POWER SYSTEMS ON A DESK TOP TO SOLVE TRANSMISSION AND DISTRIBUTION PROBLEMS



GE 307 MINIATURIZED AC NETWORK ANALYZER

Here is another example of G-E custom computer design specifically for utility application. The Miniaturized Network Analyzer solves problems too large for hand calculation, but too small to justify taking them to a large network analyzer installation. Actual detailed solutions may be obtained for such day to day problems as:

• Load flow studies • Analysis of transmission requirements to supply new loads and transmission capabilities of existing systems or proposed additions • Calculation of specifications and optimum locations for additions to portions of existing networks

Request brochure CPB-4A. Contact your nearest General Electric Apparatus Sales Division Office, or write to: Computer Department, Room 5500 General Electric Company • Deer Valley Park • Phoenix, Arizona

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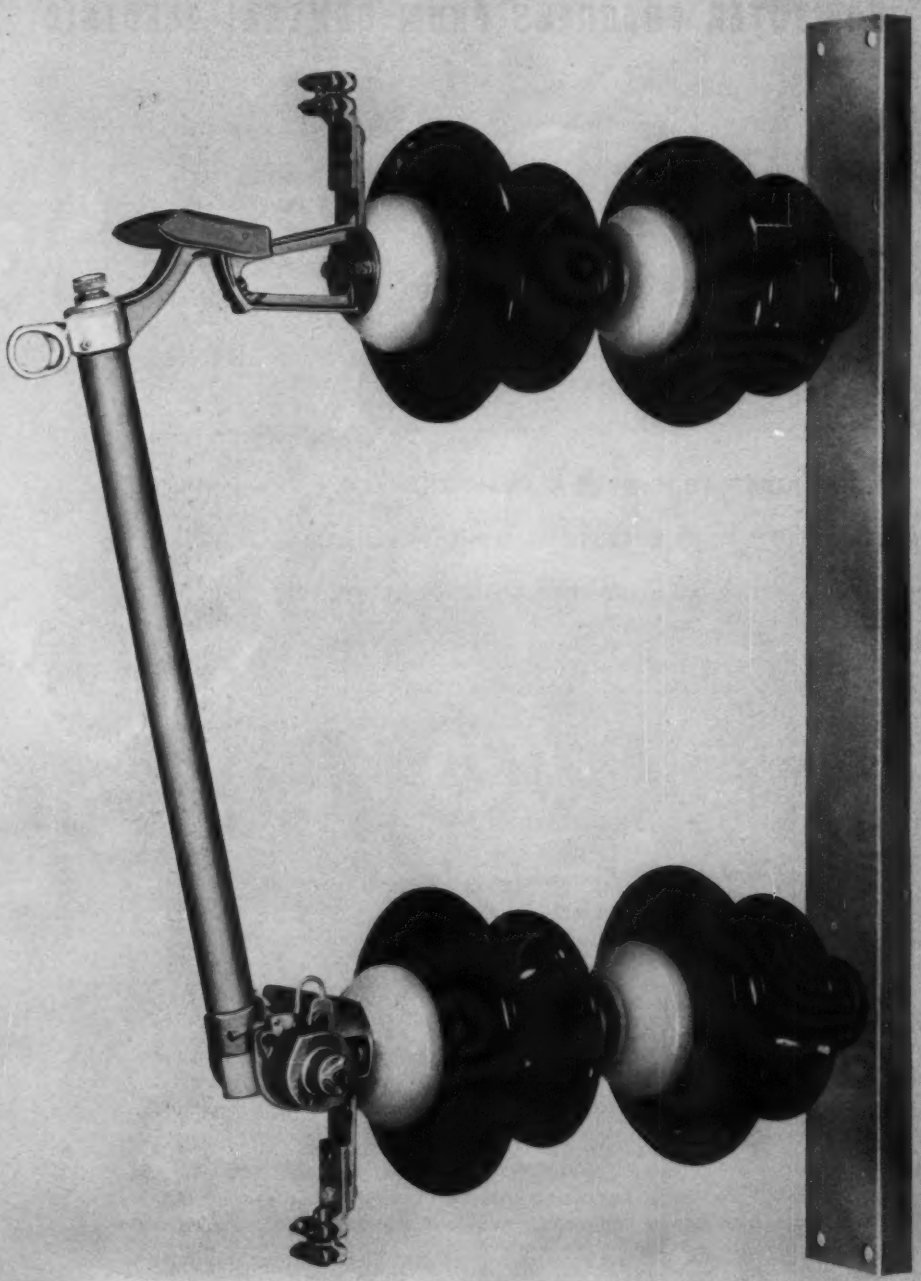
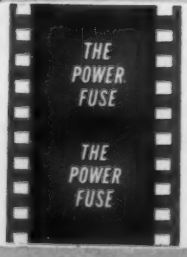
GENERAL ELECTRIC

FOR FIGURES IN A HURRY—FIGURE ON A GE COMPUTER

CPA-13 (4-59)

An Economical New Family of





New full color sound movie on power fuses now available to any interested activity

Here is the dramatic story of the Power Fuse told in 25 minutes, including animated illustrations, actual field tests, and engineering data. Factual, up-to-date, informative. For a private showing, contact your Southern States representative or write direct to the company. (16 mm, color, sound.)

Power Fuses by Southern States

- LOW INITIAL COST— LOW RE-FUSING COST
- INTERCHANGEABLE FUSE HOLDERS
- WIDEST SELECTION OF RATINGS
- SIMPLIFIED CONSTRUCTION

Engineers charged with the dual responsibility of adequate system protection at minimum cost will welcome this new family of Southern States Power Fuses—the greatest development in years!

The simplified design and construction of these powerful, reliable fuses result in immediate savings on initial costs, when compared with most other types.

Re-fusing in the field results in remarkable savings: For example, at 69 kv a comparative cost for re-fusing a 3-phase installation shows a price differential ranging as high as $422.00. Higher voltages reflect even greater savings.

When system demands increase, and higher ratings are needed, it is a simple matter to change fuse holders—using existing mountings—and thus reap additional savings.

The costly practice of applying a fuse with excessive interrupting capacity is no longer necessary. The widest possible selection of fuses in this new Southern States family permits fusing to meet exact requirements. Substantial savings, without sacrifice, can be made here!

With interrupting ratings approaching 3½ million kva at 161 kv, it will pay everyone concerned with power fuses to investigate this new family of power fuses. Contact your Southern States representative, or write direct for Technical Bulletin 59PF.

COMPLETE FUSE KITS AVAILABLE

Clearly marked fuse kits are available at low cost for re-fusing Southern States Power Fuses *in the field*, easily and quickly. All components are sealed in moisture-free polyethylene bags. Kits are available in four speed ratios: PF (slow speed), PM (medium speed), PX (fast speed) and EEI-NEMA Type PE. Time-current characteristic curves are available for all fuses.

PIONEERS IN POWER FUSES SINCE 1924

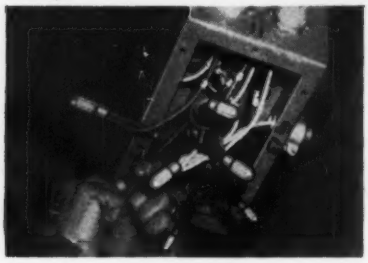
SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

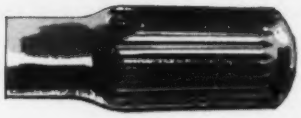
IN CANADA: Dominion Cutout Co., Ltd., Toronto

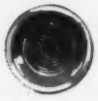
Another new development using

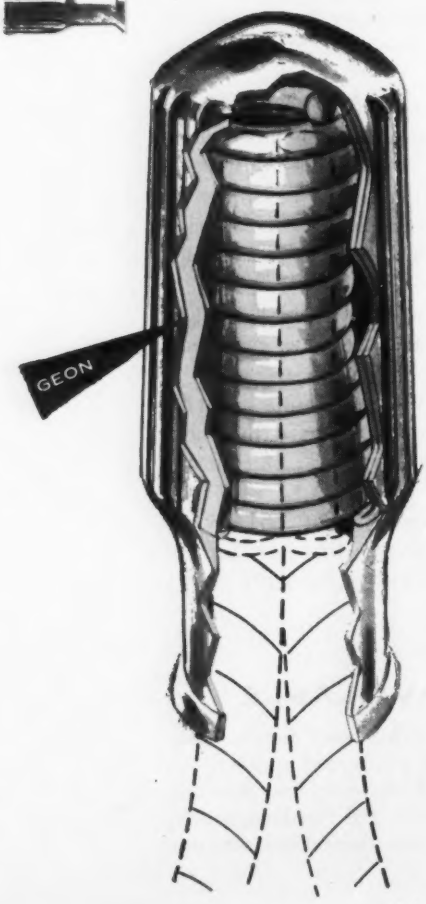
B.F.Goodrich Chemical *raw materials*

"Scotchlok" Brand electrical spring connectors, designed to give tons of holding pressure in a fraction of an ounce, are made by Minnesota Mining And Manufacturing Company, St. Paul, Minn., using caps molded of Geon by Minnesota Plastics Corporation, St. Paul. B.F.Goodrich Chemical Company supplies the Geon polyvinyl material.









High holding splices with a twist...

NEW CONNECTORS ARE CAPPED WITH GEON

Just three color coded sizes of this "Scotchlok" Brand electrical wire connector can splice over 400 wire combinations from 6 to 18 AWG solid and stranded. It consists of a bell-shaped steel spring in a hard steel shell, all fitted into a cap molded from Geon polyvinyl material.

Geon makes a tough and flexible cap. It has a long, conforming skirt to prevent flashover. And since Geon can be precision-molded, there is a knurled surface to provide finger grip, making it easier to twist the connector onto wire ends. Geon can also be molded in colors—each of the different sizes has its own color code.

Geon also provides ideal electrical characteristics. And it offers good resistance to abrasion, weathering, and heat, as well as non-flammability and low-temperature flexibility. In addition, Geon is inert to oil, chemicals and solvents.

The new U.L.-approved connector is providing permanent high-pressure splices for fixture and appliance applications, as well as for larger size wire in homes and industry. It's an example of the way that Geon makes possible new products, or new applications of existing ones. For more information, write Dept. AT-3, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

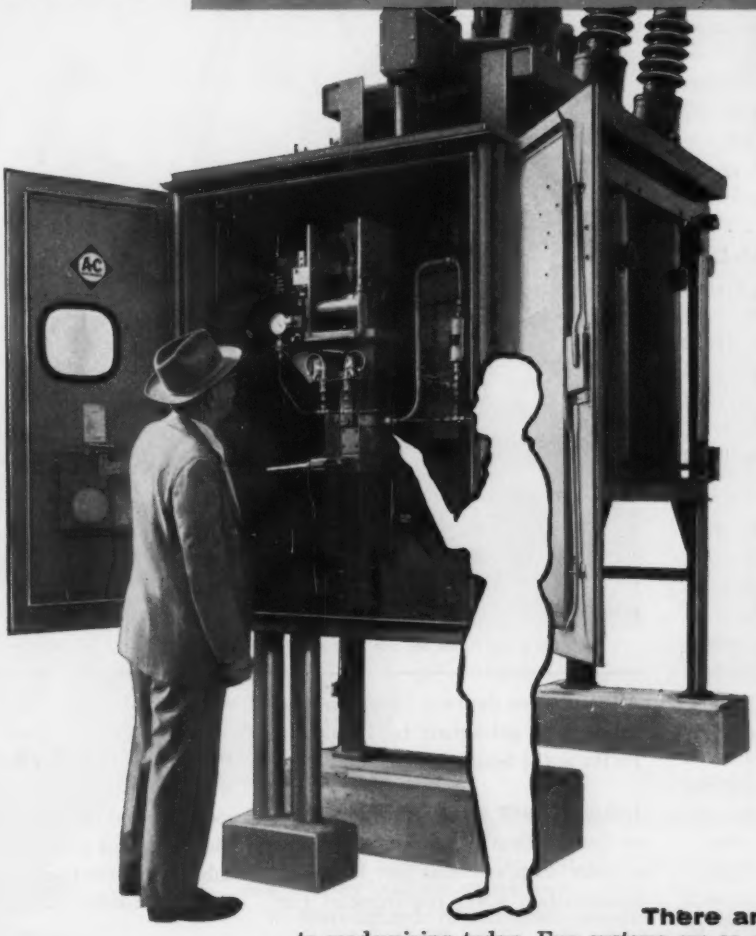
B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

ALLIS-CHALMERS modern line for '59

Look at the NUTS and BOLTS



There are no short cuts to modernizing today. Few systems are so completely outmoded that the steps needed to modernize them are completely obvious.

However, as equipment manufacturers, we at Allis-Chalmers see several areas which offer considerable potential for improvement among a wide group of utilities. One of these is what we call "Looking at the nuts and bolts."

Functionally, electrical equipment is standard today, but there's still room for the designer's genius. Looking at the nuts and bolts is one way you have of getting the best . . . the most modern . . . the equipment with the most unusual and helpful features.

A-5993-E

ALLIS-CHALMERS

On the following pages are items of Allis-Chalmers equipment we recommend for the design "extras" that can help your company stay modern.

"Dual Highway" for Power Output of Priest Rapids

Lines built by Grant County PUD to serve BPA substation from Columbia River hydro project

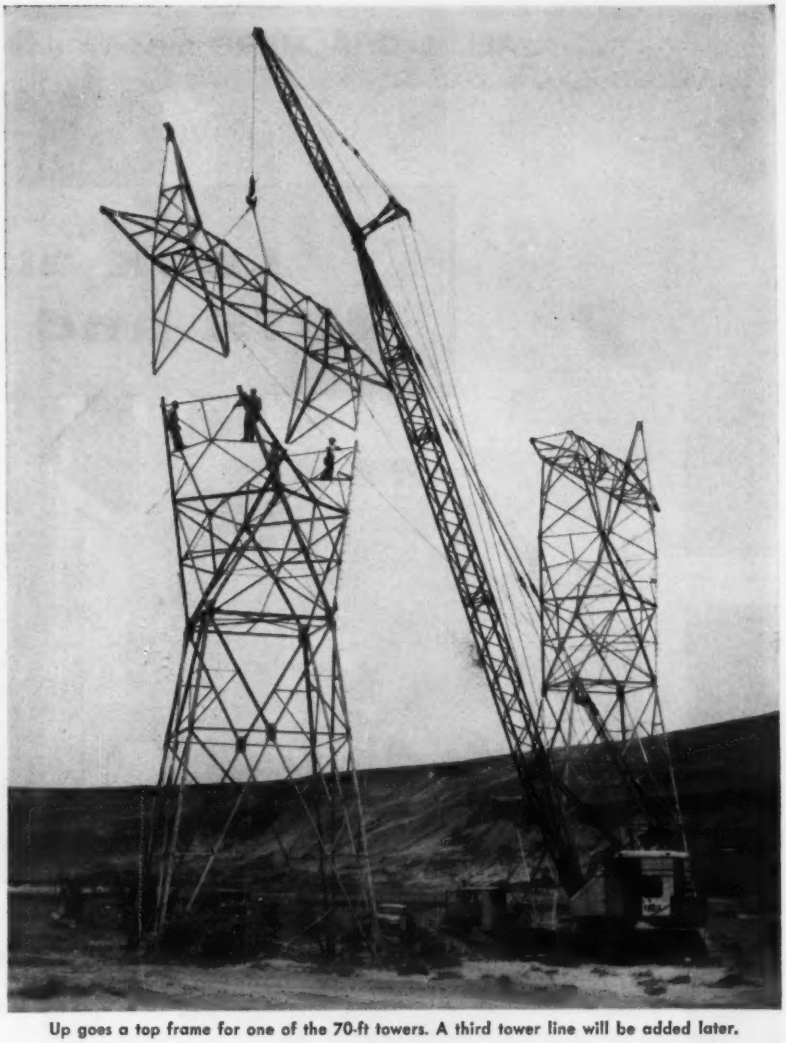
One of the nation's biggest construction jobs is the Priest Rapids Project in Washington. It calls for construction of two giant hydroelectric dams on the Columbia River. The first of these, the $166-million Priest Rapids Dam, begun in 1956, is scheduled for completion in 1960.

When completed, Priest Rapids Dam will have ten generating units with a total output of 788,850 kw. The Grant County Public Utility District, which is undertaking the entire project, will retain 36.5 pct of the power for its own use. Twelve public and private electric utilities have contracted with the PUD for the remaining 63.5 pct.

7½-MILE LINE . . . In order to serve its customers, the PUD is constructing two 230-kv transmission lines from Priest Rapids to connect with the Bonneville Power Administration system at Midway. The 90 towers are a standard BPA design, single-circuit suspension-type, with rotated bases. They average 70 ft in height, and are spaced at an average of only 800 ft, to minimize line pull due to the high winds that are frequently encountered in the area.

An unusual aspect of line design is the use of only one static wire on each tower. This was possible because of the proximity of the "twin" lines—they are only 100 to 150 ft apart most of the way—as well as the region's low isokeraunic level. Conductors are 1,272 MCM ACSR Code "Pheasant."

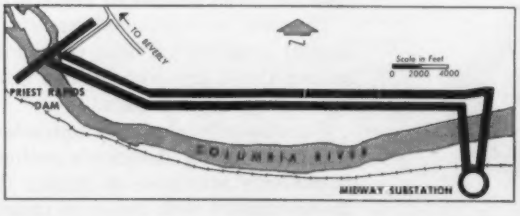
CROSSING THE COLUMBIA . . . The lines cross the river just north of the substation. This required 194-ft-high towers, providing spans of 2305 and 2360 ft. They weigh 28.5 tons each, compared with an average weight of 11.5 tons for the line towers.



Up goes a top frame for one of the 70-ft towers. A third tower line will be added later.

All towers for the twin lines were fabricated and galvanized by Bethlehem Pacific at the Seattle tower shop.

THREE TOWER SHOPS . . . In addition to Seattle, Bethlehem Pacific operates a tower shop at South San Francisco. Transmission tower requirements east of the Rockies are handled by Bethlehem's shop at Leetsdale, Pa., near Pittsburgh. They're all big shops, and well-equipped—capable of work to the most demanding standards. If you're in the market for transmission towers and substation structures, please call the Bethlehem sales office nearest you.



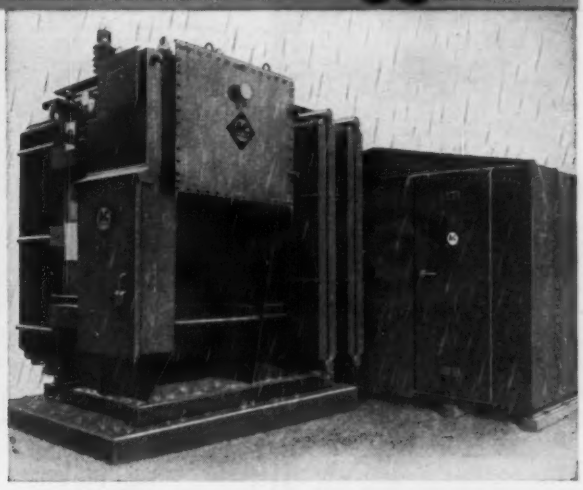
Route of the twin 230-kv lines, known as Priest Rapids-Midway lines Nos. 1 and 2. Length is about 7½ miles. Design was by Harza Engineering Company of Chicago. The Key Construction Company of Tacoma, prime contractor for the twin lines, erected the towers.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

ALLIS-CHALMERS modern line for '59



- Aisleway accessibility — current transformers in front of positive-acting shutters.
- Automatic connecting, self-aligning secondary disconnects — no plug jumpers.
- Interlock-guide track self-aligns breaker.
- Flush mounting with floor eases breaker insertion.

NEW

Shelter-Clad . . .

completely accessible switchgear

Check these important "accessibility" features of Allis-Chalmers new 4.16-kv outdoor switchgear:

Well-lighted 75-inch-wide service aisle for clean, roomy, indoor protection.

Eye-level — no stretch — instrumentation.

Room above breaker to house potential transformers or control power transformer fuses.

Relay, rectifier, and capacitor elements are mounted on breaker for easy access when breaker is in aisleway.

Standard secondary terminal blocks are accessible from inside aisleway.

In addition to these "accessibility" features, you get *Pyro-Shield* track-resistant insulation plus unique personnel safety features.

Get all the details from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pyro-Shield and *Shelter-Clad* are Allis-Chalmers trademarks.

A-5918

ALLIS-CHALMERS

2-WAY RADIO SERVICE

Remember, too, that Motorola is a maintenance organization . . . with the largest service force specially trained to maintain 2-way radio systems to factory standards. No matter how large your radio system is—how widely distributed your mobile radios are—Motorola can provide system maintenance specifically tailored to your requirements.

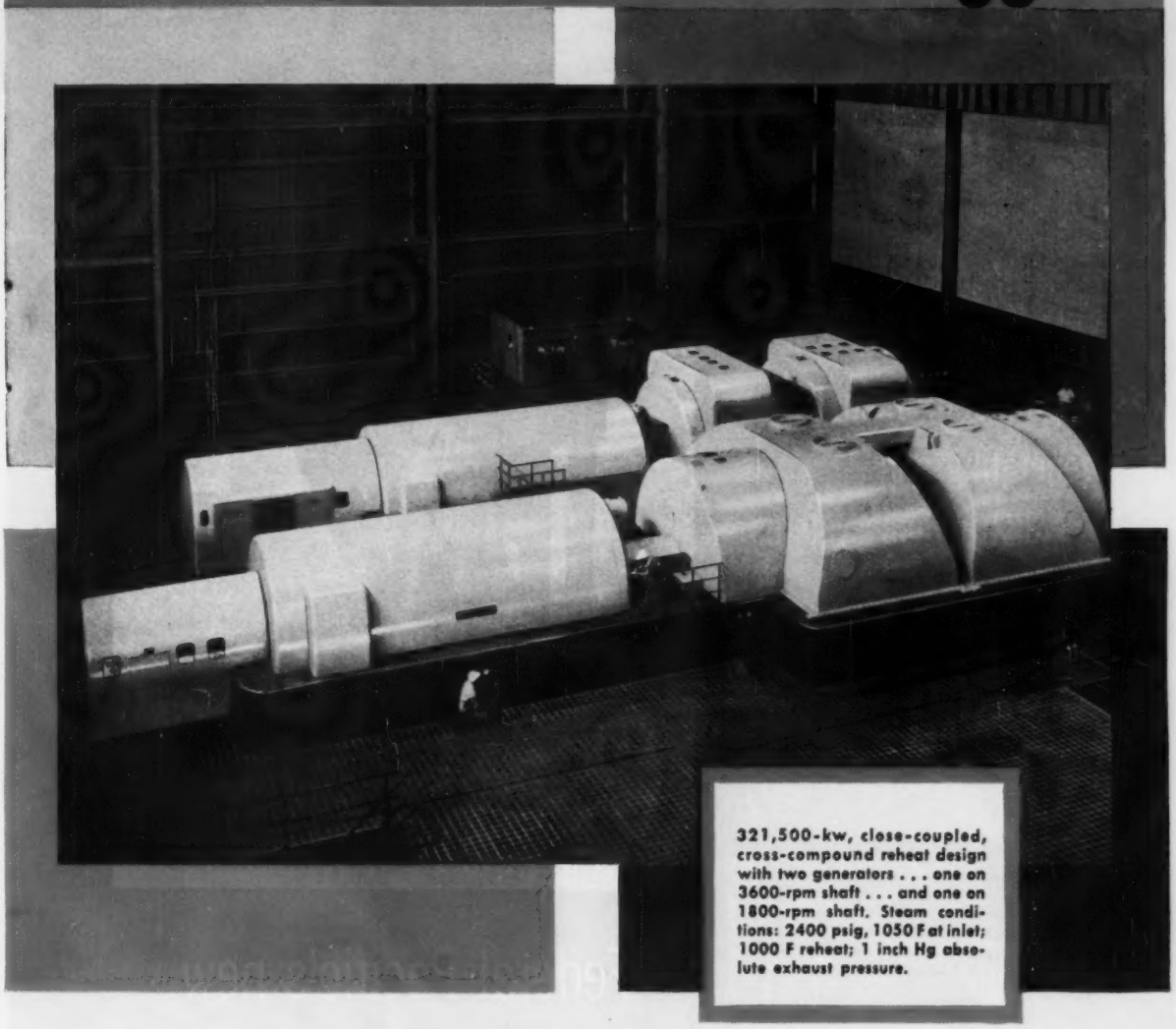
For example, one company serviced by Motorola has more than 500 mobile units, 43 base stations and a 200-mile microwave system.

You, too, can have confidence in the service provided under a Motorola Maintenance Agreement. Write today for full details.

MOTOROLA

Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, Ill. A Subsidiary of Motorola, Inc.

ALLIS-CHALMERS modern line for '59



321,500-kw, close-coupled, cross-compound reheat design with two generators . . . one on 3600-rpm shaft . . . and one on 1800-rpm shaft. Steam conditions: 2400 psig, 1050 F at inlet; 1000 F reheat; 1 inch Hg absolute exhaust pressure.

Detroit Edison's new 321,500-kw machine goes on the line

River Rouge Unit 3 increases the capacity of the Detroit Edison system to 3¼ million kilowatts — double its capacity of 10 years ago.

In size, in design, this steam turbine-generator unit was the beginning of a new era in power generation.

Of special interest are the record size 46-inch exhaust blades; and the close-coupled arrangement with the crossunder piping located above the foundation which made it possible to build to compact over-all dimensions.

For an interesting discussion of this turbine, see ASME paper 58-SA-22 . . . available through your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

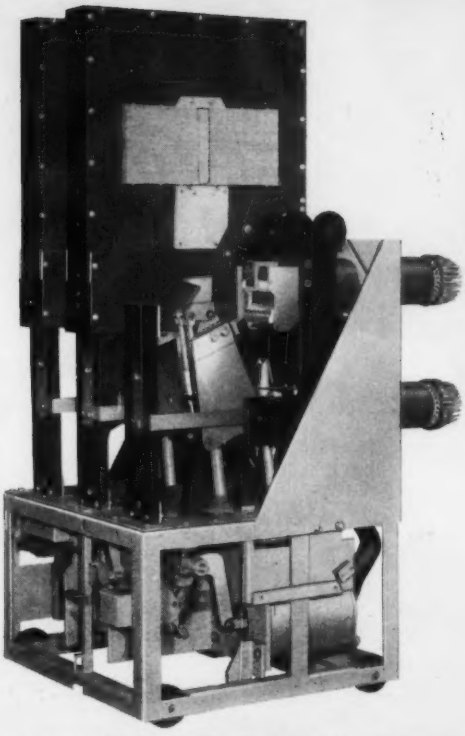
Plan to stay ahead MODERNIZE

ALLIS-CHALMERS

A-5938-E

Now in service...
controlling and
protecting modern
generating and
distribution systems

NEW BREAKERS BEING ASSEMBLED AND SHIPPED



Type DST 5 kv 350 mva Air Circuit Breaker 1200 and 3000 amps

Federal Pacific's new 5 kv 350 mva Air Circuit Breaker

Your increased capacity requirements dictated its need. Our commitment to provide a complete quality line prompted its manufacture. Latest technicological advances shaped its development. Built for ruggedness, long life, ease of maintenance and inspection, it naturally meets all NEMA, ASA, AEIC and AIEE standards. Federal Pacific has created a new 5 kv, 350 mva Air Circuit Breaker of beautiful proportion, striking simplicity and masterful performance. Write for Bulletin 3-450, Federal Pacific Electric Company, General Offices: Department 259, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

The Electrical Week

FUTURE NEWS ▶ **A Northeast Power Administration may come into being** if a national public power group gets its way. It will soon call for an NPA.

LATE NEWS ▶ **Washington Wire** . . . Senate approves two-year, $200,000-plus study of the nation's water and power needs through 1980 . . . Sen Hubert Humphrey denies he is a "whole hog" public power advocate, but adds "If federal (power) development went forward as rapidly as it should, there would be an abundance of low-cost power for all—from the smallest cooperative to the largest private power company."

TVA asks for bids from domestic, foreign firms on 6 million kw worth of steam turbine generators by May 26. Request is believed to be in anticipation of a self-financing bill.

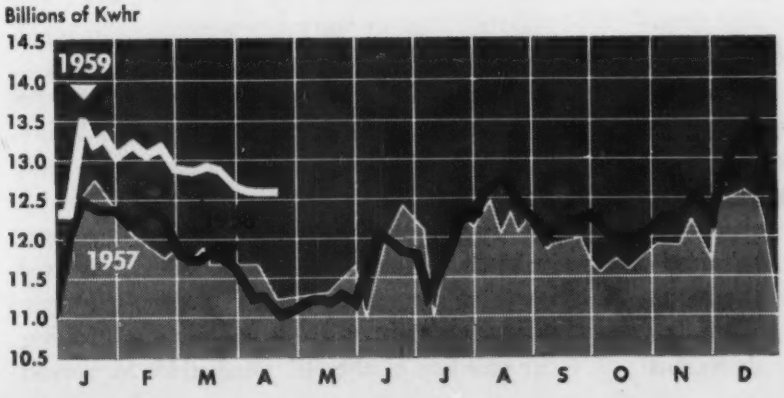
Nuclear Notes . . . AEC to build plutonium-producing reactor that might be converted to a power-producing plant at Hanford, Wash., reportedly to keep peace with the Joint Committee on Atomic Energy . . . Minneapolis-Honeywell develops "thermal plant simulator" for training A-plant personnel.

Georgia Power proposes joint hydro development with Army Corps of Engineers on the Coosawatee River. Under the proposal, the Army would build the dam and reservoir, Georgia Power the power plant.

Allis-Chalmers and United Auto Workers settle strike. Half of some 14,000 employees returned to work April 20. Others will return following their ratification of contract.

Management changes . . . E. J. Drewelow moves up to president at Empire District Electric Co. J. T. Jones is new vp . . . W. E. Montgomery becomes vp at Southern California Edison Co . . . W. R. Poole is new vp of sales at Toledo Edison . . . Three new vice presidents at Western Light & Telephone are C. F. Edwards, H. V. Rathun, and E. C. Rohrbaugh.

WEEKLY POWER OUTPUT—UP 13.5% (Week ending April 18), Kwhr 12,609,000,000



Per Cent Change From Previous Year

	April 4	April 11	April 18
Total U. S.....	+11.4	+11.5	+13.5
New Eng.	+10.3	+ 7.8	+ 9.7
Mid. Atlantic ..	+ 9.7	+ 9.9	+11.7
Cent. Ind.	+16.1	+14.2	+17.1
West Cent.	+ 9.7	+10.8	+11.7
Southeast	+ 5.9	+ 4.9	+ 8.8
South Cent.	+14.0	+16.2	+14.3
Rocky Mount...	+14.5	+14.3	+12.9
Pacific			
NW	+ 8.0	+ 9.5	+11.8
SW	+16.8	+23.2	+23.8

Seasonally Adjusted Index 252.0

Week Ago 250.6 Year Ago 220.6

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **New wage contracts average slightly under last year's 5%,** judging from negotiations concluded recently. Gulf Power strike continues **(p 44)** . . . House passage of REA re-organization bill accompanied by criticism of co-op lobby group's "low-level propaganda" **(p 45)** . . . Concept of electric cars is greeted coolly abroad. Truck market—and recharging load—is more encouraging **(p 46).**

ENGINEERING ▶ **Improved methods cut industrial substation costs at Houston L&P.** Details of cover story begin on **page 56** . . . A 230-kv line will connect Consolidated Edison's Indian Point A-plant with rest of system **(p 67).**

AMERICAN POWER CONFERENCE ▶ **TVA's Vogel denies mutual threat of public and private utilities** at American Power Conference, wants systems to grow side by side **(p 50)** . . . Soviet engineers describe USSR power developments **(p 52).**

SOUTHEASTERN ELECTRIC EXCHANGE ▶ **Industry leaders set goals at SEE 26th Annual Conference.** Corette, Furr, Singleton and others map objectives for electric heating, public relations, organizational cooperation and A-power **(p 49).**

PROCUREMENT & PRODUCTS ▶ **Procurement and Products—A new Electrical World feature** includes three sections: (1) A section on prices, orders, commodities, meet-

Politics and Public Power

A LESSON IN DEMOCRACY

The people of Montana recently gave their state legislators and the nation a lesson in democracy, and they demonstrated once again the truth and vitality of that adage which says that if the people are given all the facts, if they are allowed to hear both sides of the story, then they will act wisely and well.

The occasion was the public hearing on a bill introduced in the Montana legislature aimed at creating state public utility districts, similar to those in neighboring Washington and Oregon. The provisions of this bill (HB 217), introduced by Rep Levi P. Tonner (D-Flathead County), were apparently so arbitrary that almost 500 interested citizens descended on Helena in the teeth of a blizzard to oppose them. Moreover, public opposition —letters and telegrams—came into the lawmakers by the thousands. Some objections:

- In the case of the Montana Power Co, the proposed PUD's would eliminate $13,500,000 in taxes. Some $5 million of this goes directly to the state and local governments and school districts.
- PUD's would be free from all control and regulation by the Montana PSC.
- The PUD's could condemn rural co-op operations and take them over.
- PUD's could levy a 2-mill tax and issue tax-anticipation warrants without a vote of the people.
- Similarly, without the vote of the people, the PUD's could set up special "improvement districts"; issue revenue and general-obligation bonds; and could go into the appliance or any other retail business.

Then, after the PUD-creating law had been on the books for six months, the state would be "barred forever from questioning the validity of the (PUD) district by reason

ings, etc; (2) a New Equipment section, and (3) A Manufacturers News section. The news in each:

Commodity prices are not likely to "take off," according to McGraw-Hill . . . Steel price hikes estimated at $3 to $10 a ton if strike comes . . . Proposed government copper sales upsets market **(p 70).**

Manufacturers News . . . For a story "in depth" about Anaconda's new EHV lab, see **page 72** . . . Westinghouse begins building 5-kw thermo electric power plant for the Navy **(p 74).**

New Equipment . . . Open-type substation simplifies construction . . . Pole-type transformers with two high voltage ratings converted by externally operated series-multiple switch **(p 76).**

ELECTRICAL BUSINESS OUTLOOK ▶ **Business barometers are still rising after a year of recovery,** and are going strong. Industrial production, kwhr sales, housing, personal income are all setting records. Capital spending is also up **(p 83).**

SELLING ▶ **Connecticut L&P electric range doubles as a space heater.** Total load is 20 kw, used for supplemental heating for chilly kitchens **(p 91).**

of any defect in the organization" of it.

Four proponents of the bill, in addition to its sponsor, spoke at the hearing. Principal speaker was Gus Norwood, executive secretary of Northwest Public Power Assn. Norwood called PUDs "Progress under Democracy," described how the districts, when moving into the country, could pick up the "skimmed milk" of the rural co-ops, add it to the "rich cream" of the cities, and thereby serve all the people at low rates. But, anticipating co-op opposition, he suggested that the co-ops be exempt from condemnation. His other suggested amendments:

- Take away PUD power to issue general obligation bonds; PUD's can operate on revenue bonds alone.
- Adopt the Oregon law that says PUD's must pay same taxes as any other utility.

He added that (1) Washington PUD's have marketed more than $600 million in revenue bonds since 1930, and PUD's would make power companies more careful.

Montana Power Co Pres Corette ticked off these rebuttals to Norwood's arguments:

- PUD's are not so popular in Washington and Oregon. In both states more customers are served by private utilities. No new PUD's have been permitted since 1940.
- Montana's 10-year gain in value added by manufacture has been 167%, compared to Washington's 122%. Capital spending went from $7,800,000 to $83,657,000, more than PUD's could hope to match. Corette cited these figures in answer to Norwood's claim that PUD's bring in new industry.

Other speakers also refuted Norwood and Tonner's claims. Apparently the bill's opponents impressed the legislators, because despite a committee "Do Pass" recommendation, it was defeated 48-40.

The people once again had spoken.

Executive Reader

Step-by-step guidance in the writing of technical, engineering, and scientific material starts with the simplest writing job and advances to the most difficult. A new manual on the subject will aid engineers, scientists, and technicians who have not written before, as well as established technical writers. **Successful Technical Writing. Tyler Hicks.** Published by McGraw-Hill Book Co, Inc, New York, N. Y. 287 pages. Price $5.50.

Plant accounting costs are cut through use of a unit-of-property system that is based on 96 items in the overhead distribution line. The new system reduces crew labor entries on time-keeping forms by 70%; volume of field-generated forms for office processing has dropped by 65%. **W. T. Kyle, and W. J. Franklin, Southern California Edison Co, Electrical West, April, 1959.**

TECHNICAL NOTES

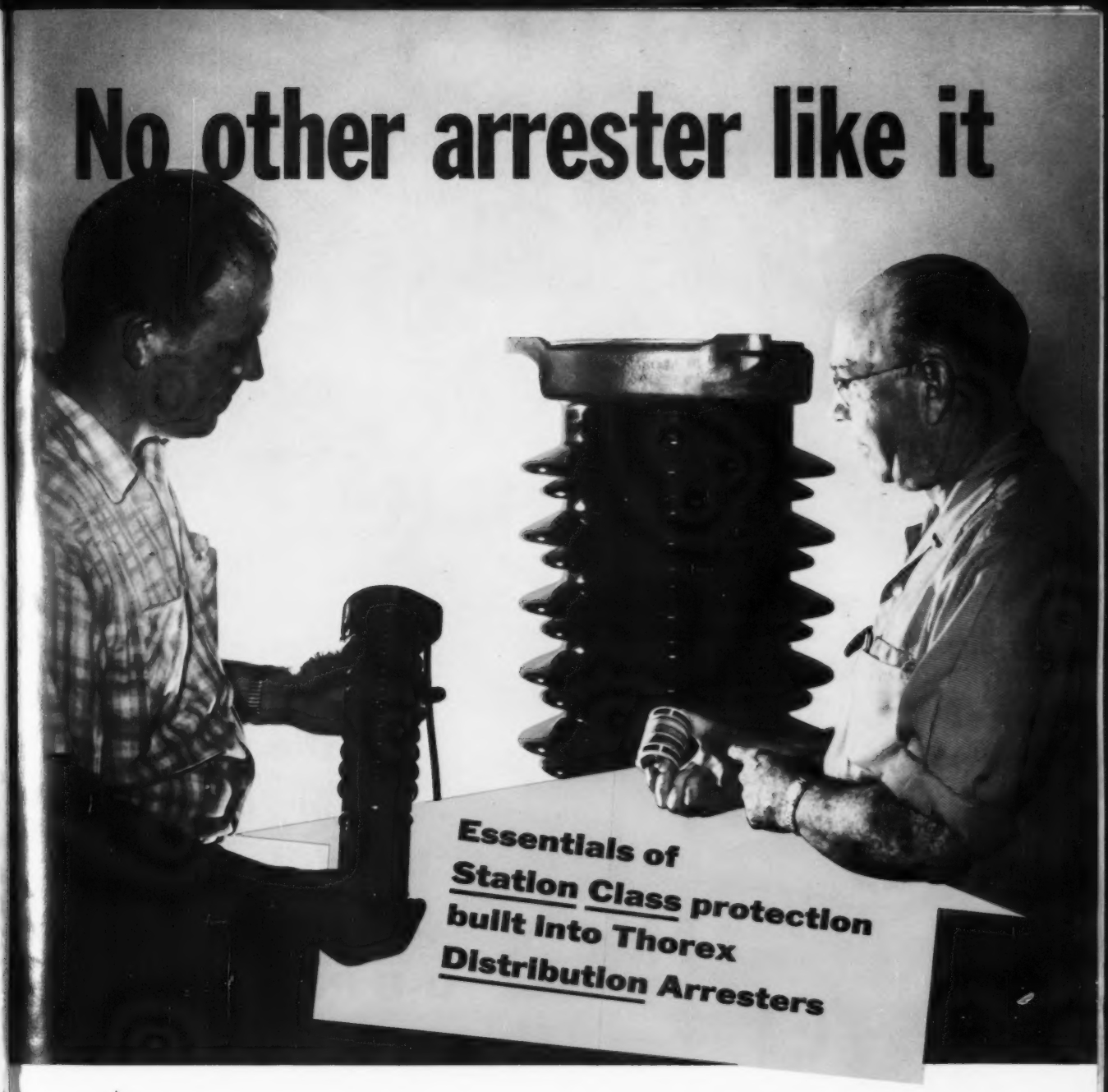
Selective automatic emergency transfer of station auxiliaries meets the trend to automate equipment to give the operator maximum assistance in controlling large units. Automatic transfer of auxiliaries of a 3,500-psi unit (Avon No. 8) is rapid enough to meet the special needs of the unit's control system. **J. P. Fitzgerald, C. F. Paulus, and H. A. Vargas, Cleveland Electric Illuminating Co, AIEE TP 59-215.**

Erosion characteristics of relay contacts are explained through expressions which predict the time when a "short" arc becomes unstable. Should the arc be extinguished when critical conditions of arc power input are not satisfied, a molten filament of metal will be drawn between electrodes. **J. L. Smith and W. S. Boyle, Bell System Technical Journal, Vol. 37, No. 2, March, 1959.**

Station ground networks may be destroyed quickly by cathodic protection systems if current is not minimized. Copper can dissolve at an annual rate of 46 lb per amp. **H. H. deLaneux and R. O. Dean, Pacific Gas & Electric Co, at the PCEA Engineering & Operating Conference, March 1959.**

Nuclear radiation has the same potential of usefulness to industry as heat and electricity. Deterrents to commercial use are ignorance of mechanism of physical changes produced, inexperienced in radiation source design, and uncertain availability and cost. **P. C. Aebersold, AEC, Nuclear Congress, Cleveland, April 1959.**

No other arrester like it



Conventional lightning arresters have always been built up to -- or down to -- their intended service. Station, Intermediate, or Distribution Classes had their separate grades of product integrity. *This is not true with the Thorex Dynagap!*

The remarkable Dynagap element, that has brought a revolutionary improvement to the whole arrester art, is interchangeable in every O-B Thorex model -- every arrester class. As a result, the more significant requirements of industry standards for heaviest-duty Station Class are now greatly exceeded by the "lowest-duty" Thorex Distribution Class.

Thorex Dynagap distribution lightning arresters are unique in the degree of service and equipment protection they afford -- also unique in giving you this premium performance without a price penalty.

Four different models fit every line location, and will put a whole new order of safety and durability at each of these points.

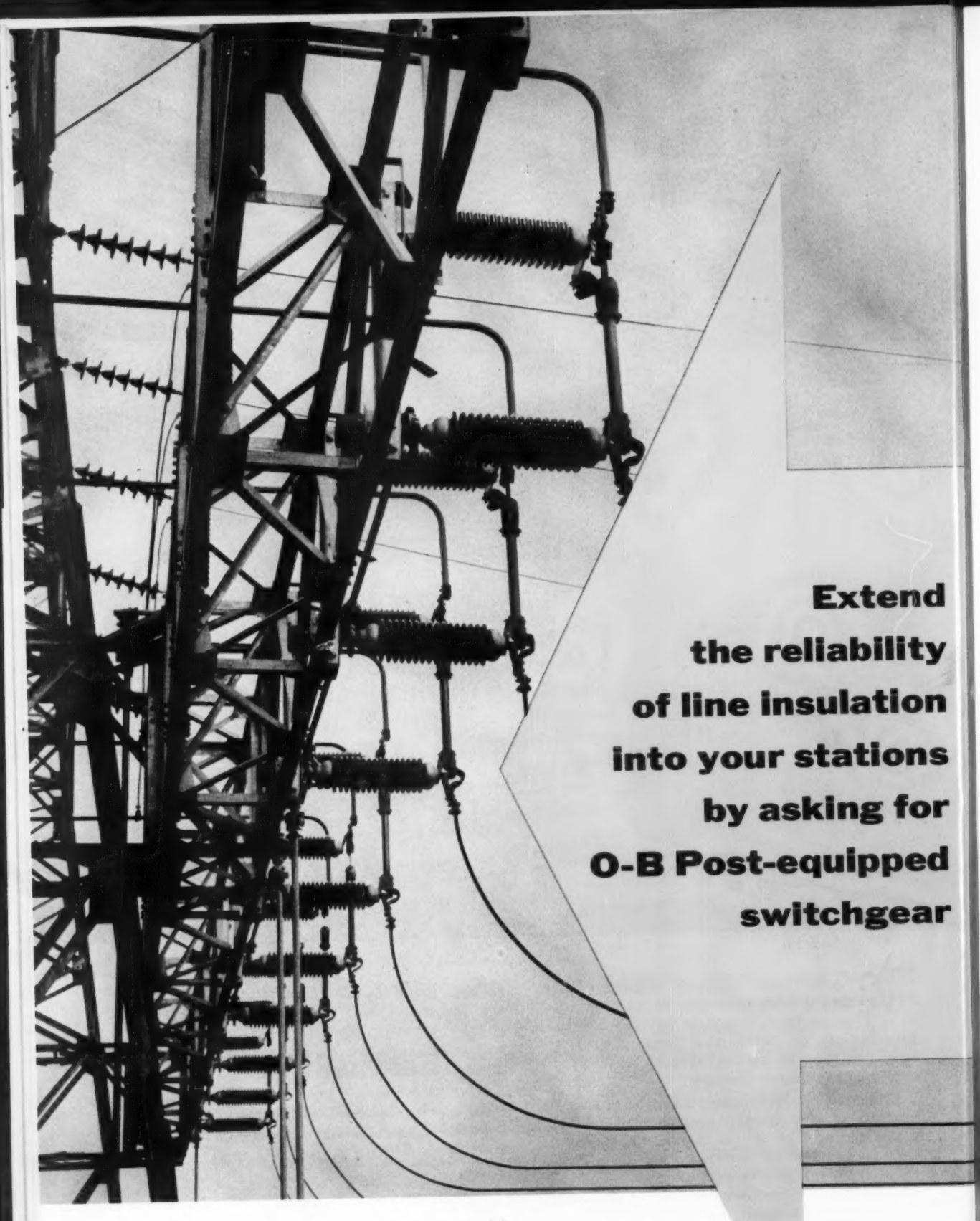
It will have been a good day when you seriously investigate Thorex Dynagap protection for your distribution system.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4926-H1



Extend the reliability of line insulation into your stations by asking for O-B Post-equipped switchgear

Dependability must go through your switches

...it takes just one word..."O-B"...to get your new switches supplied with trouble-free post insulators

Would you build a major transmission line *without ever knowing whose insulators are used?*

That line terminates at a station. It has insulators too -- just as important. Therefore, when you buy switches, is it logical to ignore the make of *their insulation?*

Switchgear manufacturers gladly perform the service of supplying your favorite insulators. It involves no extra trouble or expense. They simply need to know your preference. Getting your choice of insulators is as easy as saying "O-B."

With a generation of know-how behind them, and another generation of trouble-free performance ahead of them, O-B posts will extend the known reliability of your line insulation *into your stations.* And all it takes is just two letters when the switchgear order is placed. Simply say "O-B." Name it and you can have it.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
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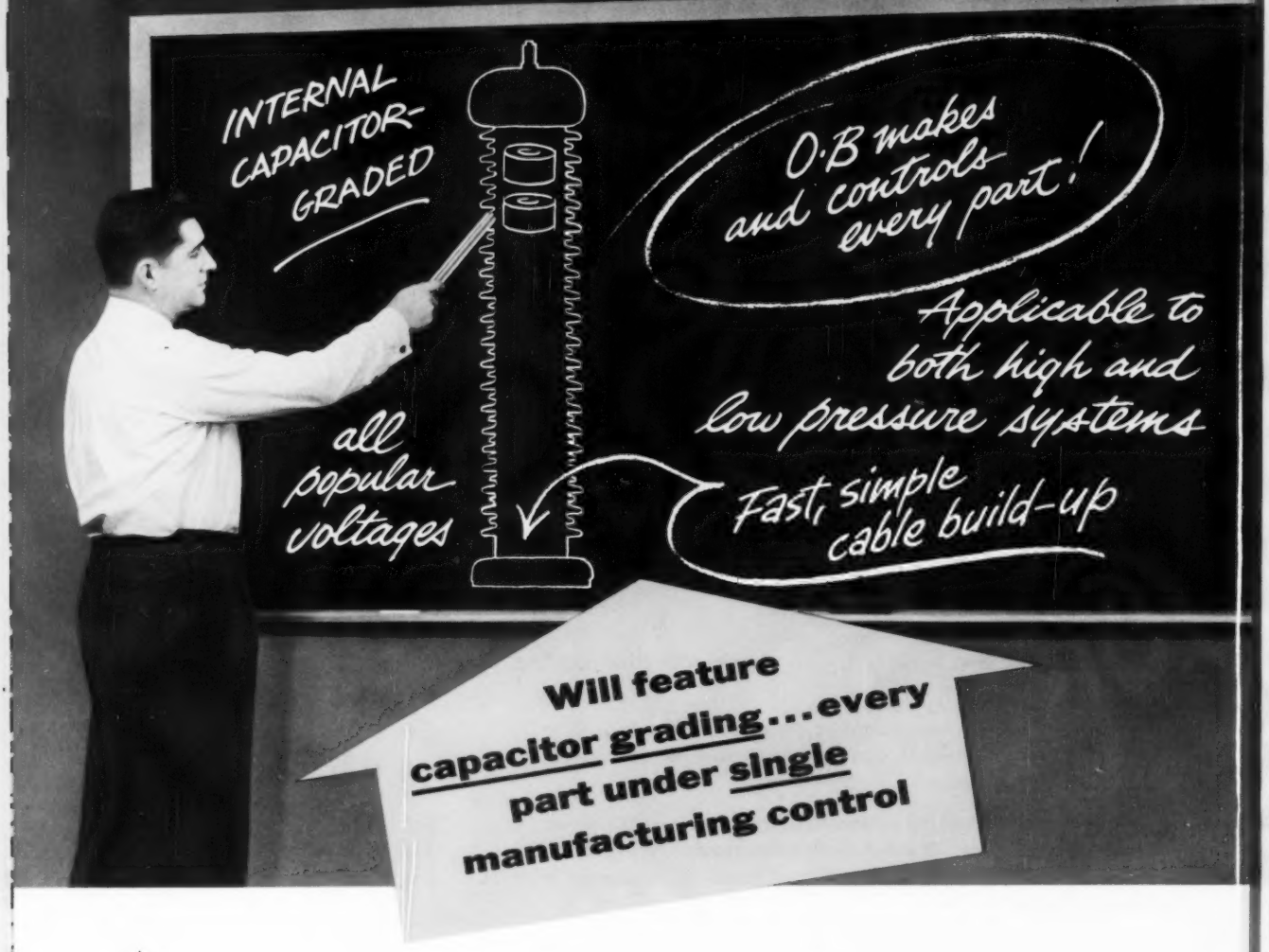
New O-B pothead coming


INTERNAL CAPACITOR-GRADED
O-B makes and controls every part!
Applicable to both high and low pressure systems
Fast, simple cable build-up
all popular voltages
Will feature capacitor grading... every part under single manufacturing control

Because of the definite need for a modernized design of capacitor-graded terminal for oil-filled cable, O-B is informing the industry of its new pothead development. This extension of a generation of pothead experience is now nearing the final stages of tooling for quantity manufacture.

New O-B potheads will be applicable to all popular makes of both low and high pressure cable systems. Voltage ratings will cover the entire range of present industry requirements, at 115 kv and above. Internal grading capacitors are an integral part of the assembly.

Cable build-up is greatly speeded and simplified. This not only saves installation time but minimizes the period of exposure of paper insulation to the air.

O-B is in the unique position of manufacturing all components. Total control is exercised over capacitor construction, paper winding and impregnation, porcelain production, and metal working. Every part is properly coordinated, and designed and built by men with a single interest and purpose.

If you are planning oil-filled cable installations, take advantage of this new development. Your O-B representative will gladly arrange to have the necessary information provided for you.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

Pennsylvania introduces a DISTRIBUTION REGULATOR WITH a service-proved POWER TRANSFORMER TAP CHANGER

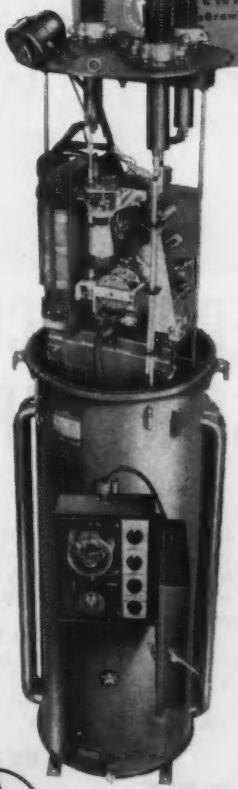
NEW PENNSYLVANIA
Pole Star Regulator
combines Pennsylvania's patented Pole Star transformer with 2 outstanding tap changing mechanisms
• SPRING DRIVE for ratings 15 through 320 amperes
• DIRECT DRIVE for ratings 321 through 668 amperes
with exclusive BOR-AMP feature to increase regulating capacity to 160% of rated current
SINGLE PHASE
60 CYCLES
± 10% REGULATION in 32—5/8% STEPS
POLE STAR
VOLTAGE RATINGS
2500
5000
7620
13800
14400
CURRENT RATINGS
15 through 668 amperes
STATION TYPE
POLE TYPE
PENNSYLVANIA TRANSFORMER DIVISION
McGraw-Edison Company • CANONSBURG, PA. • Greater Pittsburgh District

Single-phase Pole Star Regulator features direct-drive load tap changer

Although new in itself, the Pole Star Regulator is a product of Pennsylvania Transformer's long-term experience in two related fields: distribution transformers and power transformer load tap changers.

As a result, the Pole Star Regulator is introduced with a direct-drive tap changing mechanism that incorporates many of the service-proved principles of Pennsylvania's power transformer load tap changers. Positive mechanical interlocking is assured by direct drive of contacts by means of a scroll cam and index plates. Flat-velocity switch speed reduces arcing and prevents corrosion.

From its distribution transformer line, Pennsylvania has adapted the well-known Pole Star core-and-coil assembly. Included is the patented lap-on-top core, which is unexcelled for low exciting current, low core loss, and uniform quality.



Write for This Bulletin

Bulletin PSR-951 gives details of the 32-step Pole Star Regulator—available in 27 single-phase distribution sizes. For a free copy, use the coupon below, or write on your company letterhead.

NAME _____

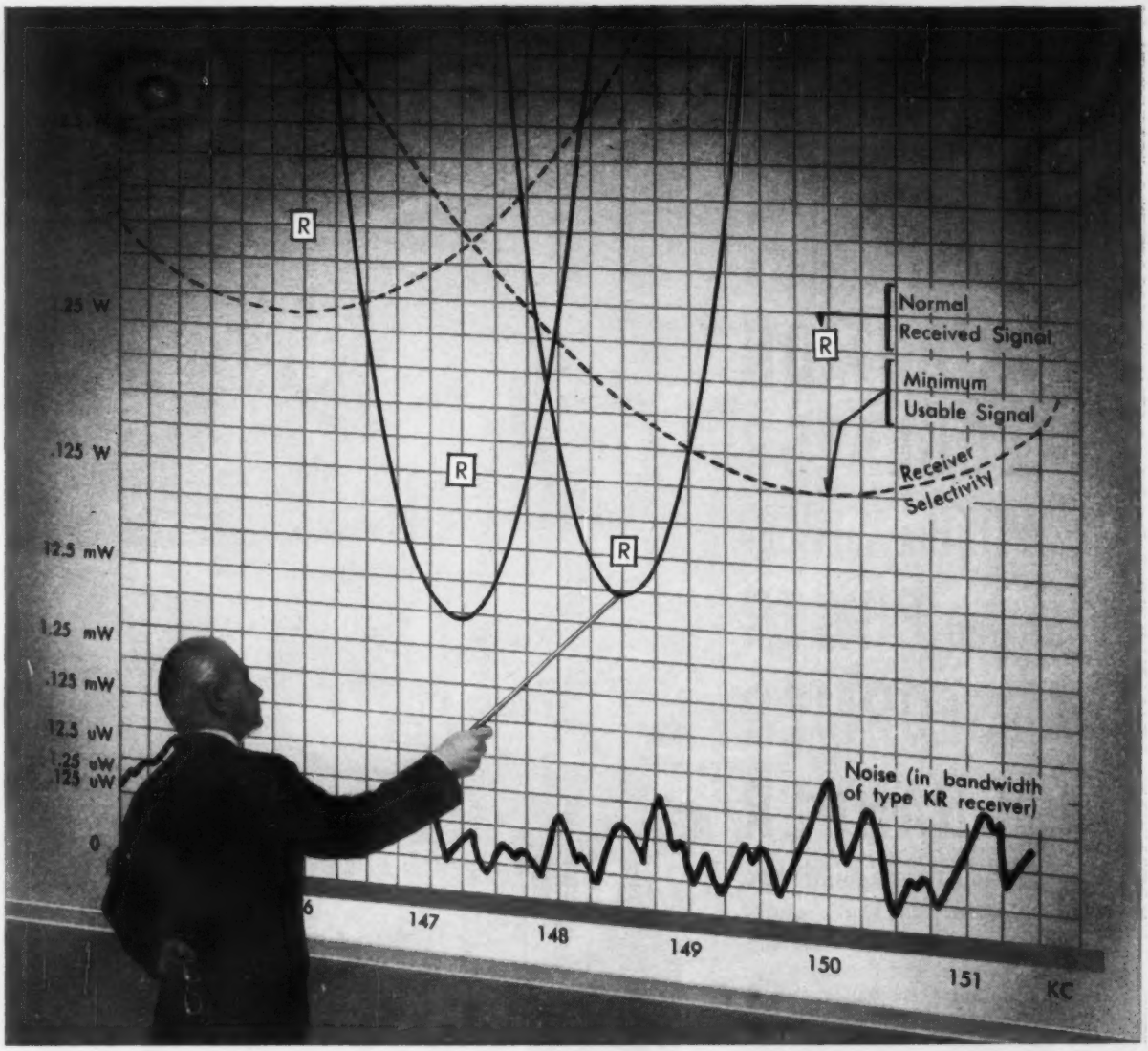
COMPANY _____

ADDRESS _____

CITY _____ STATE _____

McGRAW-EDISON *Mail to Pennsylvania Transformer Division McGraw-Edison Company, Canonsburg, Pa.*

PENNSYLVANIA DISTRIBUTION REGULATORS



DOUBLE YOUR POWER-LINE CONTROL CIRCUITS WITH WESTINGHOUSE KR CARRIER

The above spectograph section illustrates how two additional control channels can be added within the crowded frequency spectrum of existing high-wattage power-line carrier equipment. Type KR carrier meets a real need today of utilities faced with a growing density of control functions on tightly interconnected primary transmission systems.

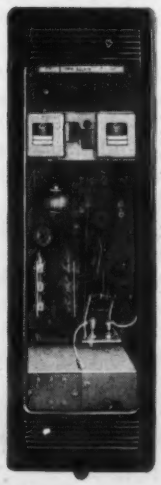
Much greater selectivity of the Westinghouse receiver permits the assignment of new channel frequencies nearer the old ones. Improved frequency stability of the KR transmitter also reduces the possibility of interference of signals with the old equipment. This combination permits the use of lower power transmitter output . . . just 1.2 watts for Westinghouse KR carrier.

It can also be observed in the above spectograph that the KR's output provides a very generous margin of safety above the average High-Line noise level.

Another Bonus Value of Westinghouse KR carrier is the exclusive use of transistors. Transistors eliminate tube replacement, reduce battery requirements 90%, cut heat radiation by 90%, and provide a unit that can be mounted on the relay switchboard . . . in 1/20 the space of other carrier equipment.

For more details about Westinghouse KR carrier —proven in five years of field experience—write for a copy of booklet B-7611 to:

Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60970



YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

INVESTIGATE THESE REASONS FOR USING OIL FILLED LINK BOXES

FOR CABLES OF ANY SIZE OR VOLTAGE

- Permits sectionalization of circuits (under no-voltage conditions), allowing isolation or grounding of one or more cables
- Point of access for phasing or fault location
- Provides low cost distribution
- Serves as an isolating barrier between cables having different types of insulation
- Serves as a stop joint to reduce internal cable pressures caused by varying elevations of cable routing
- Specialized skill generally required for making wye joints is reduced to normal skill needed for straight joints or pothead installations

Conduct your investigation through a G&W representative. He will be glad to assist you.

Illustrated above: Oil filled box with gas filled cable-heads and stud bushings—3 way, 3 pole, 34.5 kv, 500 mcm, LPGF cables. (Available also with hermetically sealed potheads—either may be filled with compound, oil or gas.)

G&W ELECTRIC SPECIALTY COMPANY

3500 WEST 127TH STREET • BLUE ISLAND, ILLINOIS

CANADIAN AFFILIATE — POWER-ITE DEVICES, LTD. — TORONTO, ONTARIO, CANADA

A 1958 addition to the Niagara Mohawk Power Corp. transmission system is this 230 kv double-circuit line. Running approximately 15 miles from Huntley generating station to Packard substation, it includes two crossings over the Niagara River. At the upper crossing, the line spans 1812 feet between two 300-foot towers. The lower river crossing, shown here, is on three 265-foot suspension towers, making the crossing in two 1880-foot spans. Conductor is 1,158.4 MCM ACSR. Double strings of 26 short-spaced suspension discs support conductors on the top two arms. 24 discs in double strings carry lowest conductors. Three ground wires are used, each 3/16" stainless steel. Lapp suspension insulators included in this installation are No. 8201, 10" diameter 15,000-lb. ball-and-socket, 5" spaced.

PHOTO BY APPLETON

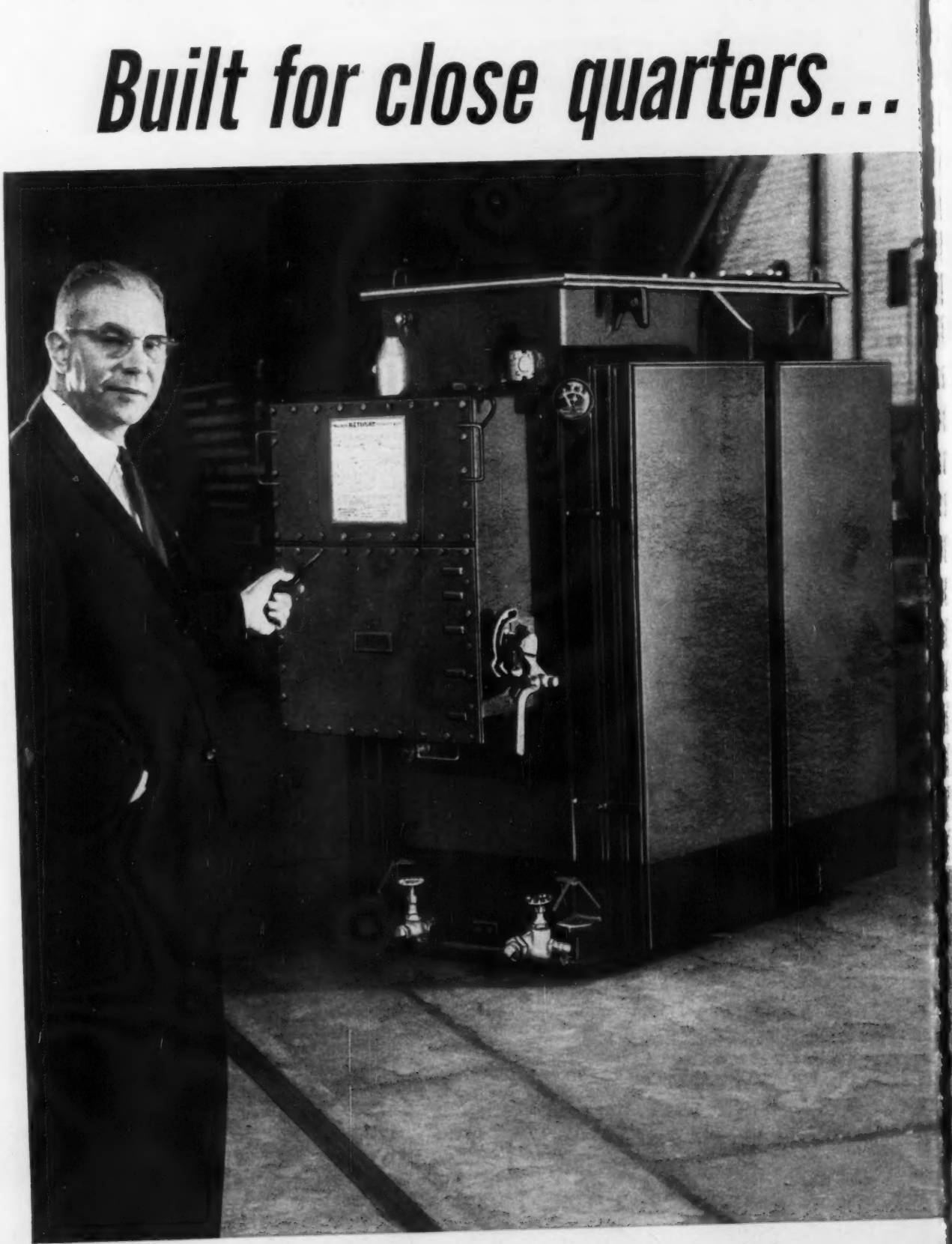
230 kv RIVER CROSSING USES 26-UNIT STRINGS ON TALL TOWERS FOR EXTRA LIGHTNING PROTECTION

It requires a total of 912 suspension insulator units to support these six conductors as they cross the three-quarters of a mile width of the Niagara River. 912 insulators, every one of which individually must carry responsibility for the security of the line. Service records of power companies the world over prove the wisdom of relying on Lapp suspension insulators. Soundness of design . . . advanced techniques of porcelain manufacture and assembly . . . tight uniformity of test characteristics . . . all add up to the fact that lines on Lapp insulators start with an *extra* margin of long life and operating security. For your new subtransmission, transmission and EHV lines, you too can rely on the specification of Lapp insulators.

Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp

Built for close quarters...



Wagner Network Transformers

are small in size...have compact switch...feature panel radiators for smoother contour

Wagner network transformers are designed to give you smaller, lighter units, with smoother contours for easier maintenance. You can cut network system costs by using smaller vaults with these space-saving transformers—or you can put larger ratings in your present vaults. You save on maintenance, too. The panel type radiators are easy to clean, and an anti-corrosive tank finish protects exterior surfaces for years, under the adverse conditions of underground installation.

NEW WAGNER-DEVELOPED ROTARY SWITCH ... The rotary type, liquid filled high voltage switch was designed especially to meet the requirements of network systems—it is smaller in depth than previously used knife-blade type switches.

LOWER NOISE LEVEL ... Improvements in core design and materials, and newly developed methods of treating the core steel have made lower noise levels a feature of all Wagner transformers.

Constant research and development have kept Wagner up front in transformer design for more than 65 years—made the name Wagner one of the foremost in power planning.

For expert advice in solving your network transformer problems, consult your nearby Wagner Sales Engineer. There are Wagner Branches in 32 principal cities.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

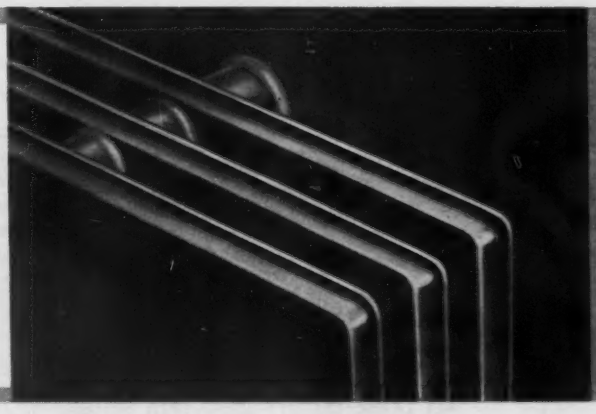
Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 14, MISSOURI

WT59-7

NEW PANEL-TYPE RADIATORS

New design radiators have smooth vertical surfaces with far fewer places where corrosive moisture and dirt can accumulate. They're easy to keep clean. Reliability is improved because there are fewer places for leaks to develop.

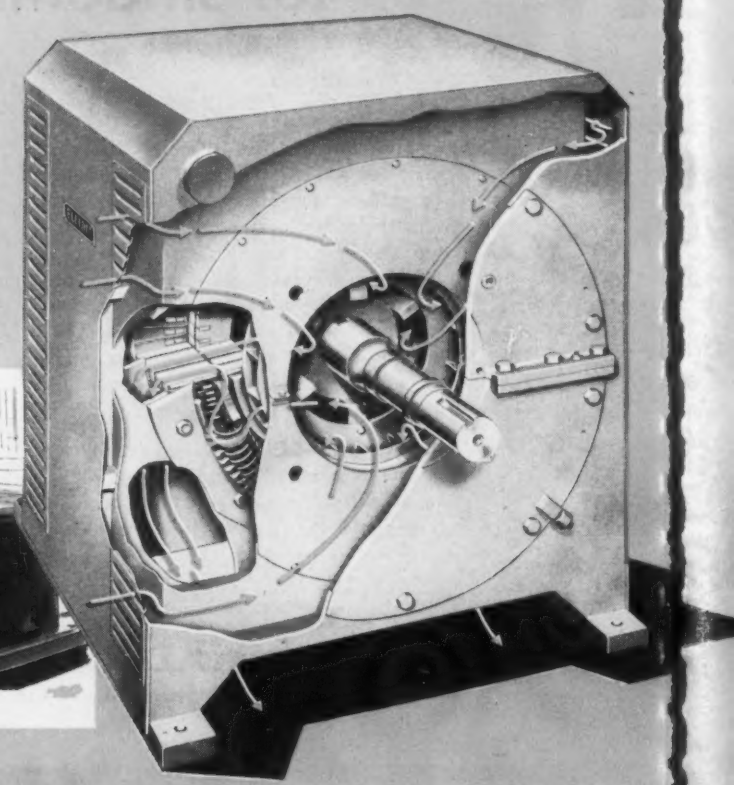


SERVING 2 GREAT GROWTH INDUSTRIES... *ELECTRICAL... AUTOMOTIVE*

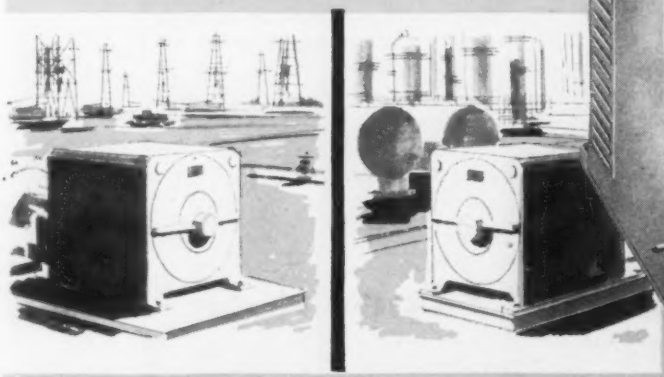
What's this ABOUT PUTTING

You can rely on Elliott Application Engineering..

Open Dripproof designs



Typical applications include outdoor installations (up to 5,000 volts) in petroleum, chemical, steel, mining, paper and many other industries.



AMPLE PROTECTION

for many applications and operating conditions due to the record-breaking performance of Fabri-Seal insulation

Today's large Elliott squirrel-cage induction motors with the now famous FABRI-SEAL coil insulation give you the most complete winding protection available. No other insulation system has such a long record of *proven* field service. Installed in over 2,000,000 hp of motors since 1948, FABRI-SEAL has chalked-up an *unmatched* 10-year operating record.

Note the excellent protection provided by the Elliott dripproof motor enclosure. Skillful arrangement of louvers and baffles prevents incoming air from impinging directly on the motor windings. The changes of direction imposed on the entering air help throw off entrapped moisture and dirt, protecting vital internal parts. This standard enclosure is not only dripproof, but offers splashproof protection equal to that of many splashproof enclosures.

ALL LARGE ELLIOTT INDUCTION MOTORS RECOMMENDED FOR OUTDOOR SERVICE FEATURE:

- protection of all metal parts from corrosion
- space heaters to prevent condensation during shutdown
- screens on air inlets to protect against debris

"INDOOR" MOTORS OUTDOORS?

Elliott engineers will carefully analyze your operating conditions and advise you frankly what type of motor enclosure will give your motors the protection you need... at lowest over-all cost.

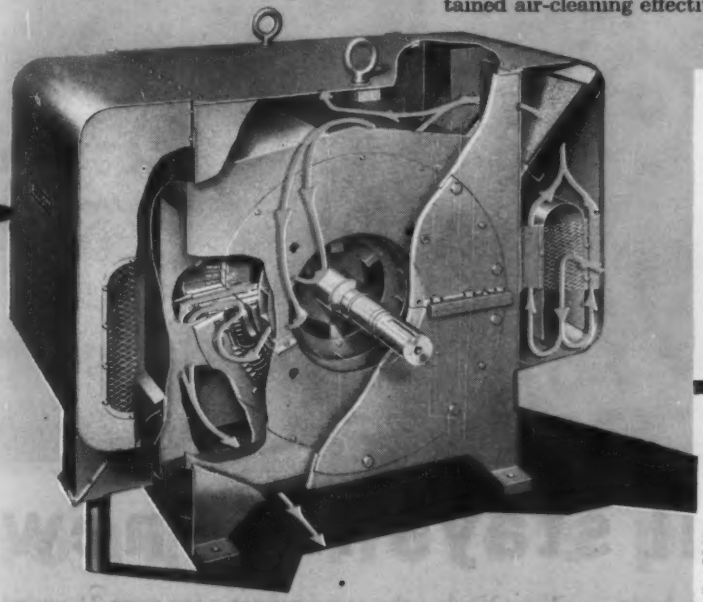
or Weather-Protected enclosures

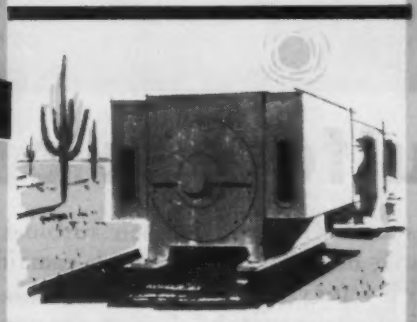
ULTIMATE PROTECTION

and assured continuity of service in the most severe conditions—driving rains, blizzards, hurricanes, salt spray, dust storms

Years ago, Elliott engineers foresaw the need for fully weather-protected outdoor motors for applications where wind and rain achieved hurricane proportions or where chemical fumes, salt spray, and extreme moistures prevailed. Such a motor would provide optimum reliability, insure continuity of service, and eliminate costly housing. Elliott subsequently designed and built such a motor—the first *really* "weather-protected" motor, with FABRI-STEEL construction and FABRI-SEAL coil insulation. Since 1948, more than 800,000 hp of these weather-protected motors have been installed and have achieved an unmatched 10-year field service record.

The cutaway illustrates how screened horizontal air inlets permit through passage of wind-driven rain, snow or sand; multiple baffles impose numerous direction and velocity changes on the entering air, assuring efficient removal of air-borne moisture; and (when desirable) large, cleanable air filters for maximum sustained air-cleaning effectiveness.





Typical applications include utilities, pipelines, refineries, chemical plants, and other outdoor installations involving severe weather or atmospheric conditions.

ELLIOTT Company
Ridgway Plant, Ridgway, Pa.

R9-5

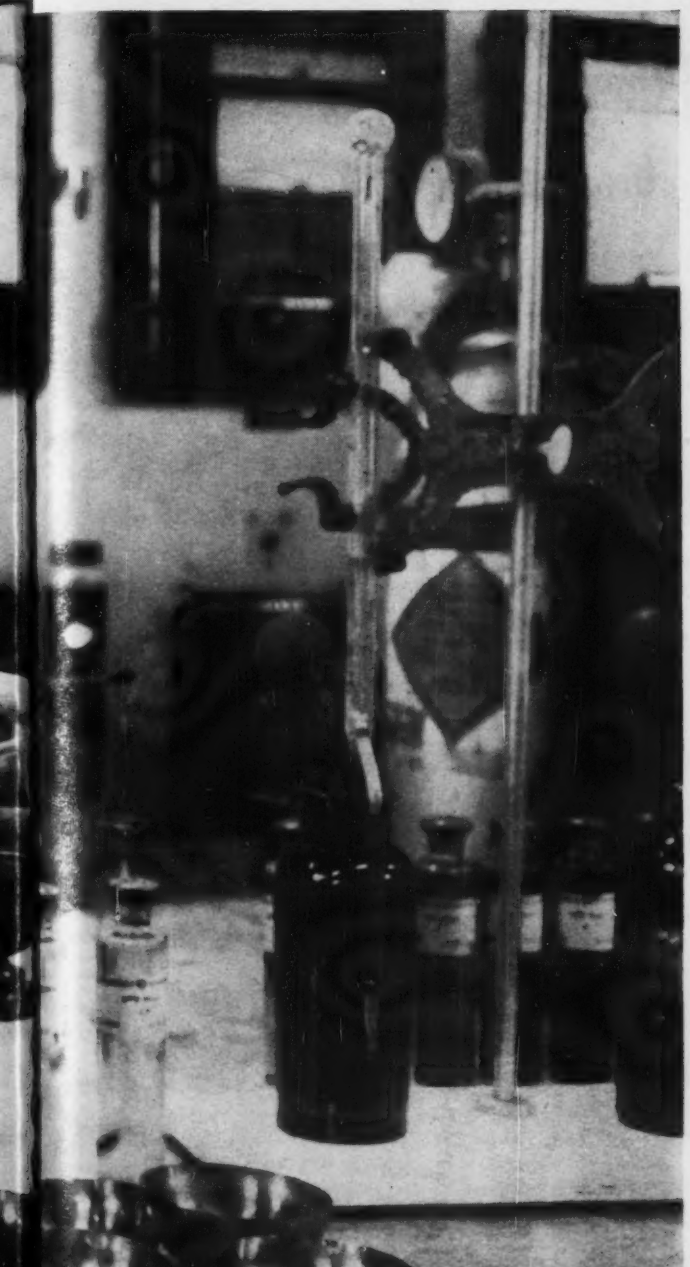
Gulfcrest oil stays like new

Utilities with Gulfcrest in their turbines have found that neutralization numbers remain consistently low for years and years *and* years . . . with test samples surprisingly close to the specifications for new oil.

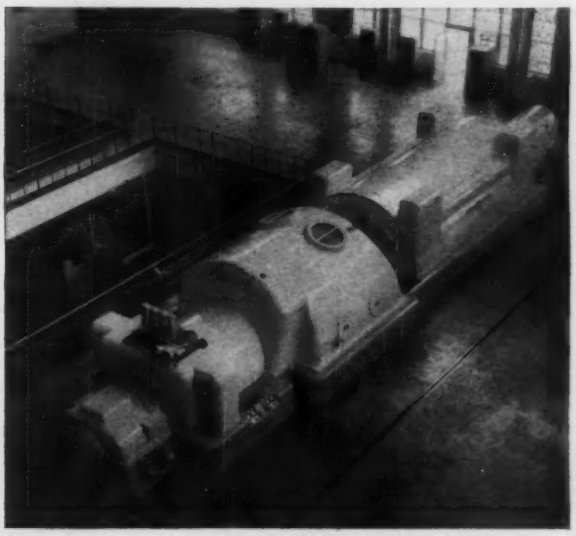
In Florida, for example, one Gulfcrest user reports a neut number of .04 unchanged in over 10 years. In New Jersey, another user found neut numbers consistently low for over 17 years. In New York—the same report—for over 21 years!

The reason lies in the super-refining of Gulfcrest. Gulf's exclusive Alchlor process weeds out harmful unstable hydrocarbon molecules which could lead to oxidation and formation of sludge, emulsifiers and harmful acids. Without these weak molecules Gulfcrest lasts longer, helps keep turbine systems clean through years of service.

Small wonder that in Gulf's marketing area,



Tampa Electric Company of Florida runs lab tests on their used Gulfcrest oil every 30 days. Report—neutralization numbers remain remarkably constant.



Georgia Power Company's Yates plant found Gulfcrest so stable in their original 4 turbines that they've chosen Gulfcrest for a fifth new unit of 125,000 kw.

Atlantic City Electric Company's Deepwater Station at Penns Grove, N. J., reports a typical Gulfcrest performance: consistently low neut numbers in over 17 years of service.

longer. Here's proof:

more power is generated by central station steam turbines lubricated with Gulfcrest than by units using any other lubricant.

Let Gulfcrest prove to you that Gulf makes things run better. Phone your nearest Gulf office and ask a Gulf Sales Engineer to visit your plant. Or write for the illustrated Gulfcrest booklet.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

GULF

GULF MAKES THINGS RUN BETTER!

For the U.S. Army Missile Master—

Where Reliability is a Command:—

S&C Metalclad Switchgear is used on the primary power supply

Missile Master Power Substation showing S&C Metalclad Switchgear. The principal contractor: The Martin Company, Orlando, Florida, with Airborne Instruments Laboratory, American Machine & Foundry Company.

At Fort George G. Meade, Maryland, this vital electronic installation collects information on the location of aircraft, presents this information on displays for decision, and then distributes selected data to NIKE missile batteries in a large defense area. The high-voltage power supply for the radar and electronic devices uses S&C Metalclad Switchgear for primary protection and switching.

Specified as part of this ultra-reliable nerve center of the Nation's defense are S&C Metalclad Switchgear units, using Power Fuses and Load Interrupters. See inset, left.

Such installations will be used in many areas throughout the United States, where NIKE installations protect population and industrial centers.

For further information about S&C Metalclad Switchgear, write to S&C Electric Company, 4421 Ravenswood, Chicago 40, Ill.

Specialists in High-Voltage Circuit Interruption for Utilities Since 1910

S&C

METALCLAD SWITCHGEAR

Wallace, if you'd read the Roebling Roeclamp® book this never would have happened!
ROEBLING
ROECLAMPS
WITH ASSOCIATED CABLES
What a mess!

Free! The most electrifying news a utility company can read is contained in this new book about Roebling Roeclamps with Associated Cables. It tells all about the remarkable new aerial suspension clamps that give you a 5kv, 8kv, or 15kv system costing 60% less than self-supporting cables...a system that installs in a breeze, minimizes tree problems, carries more current, looks great, and which is virtually "storm-proof"! There's absolutely nothing like Roeclamps with Associated Cables... and if you distribute power, you need this book! No cost, no obligation—and the savings are all yours! For your copy, write today to Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

Electrical Wire Division EW
John A. Roebling's Sons Corporation
Trenton 2, New Jersey

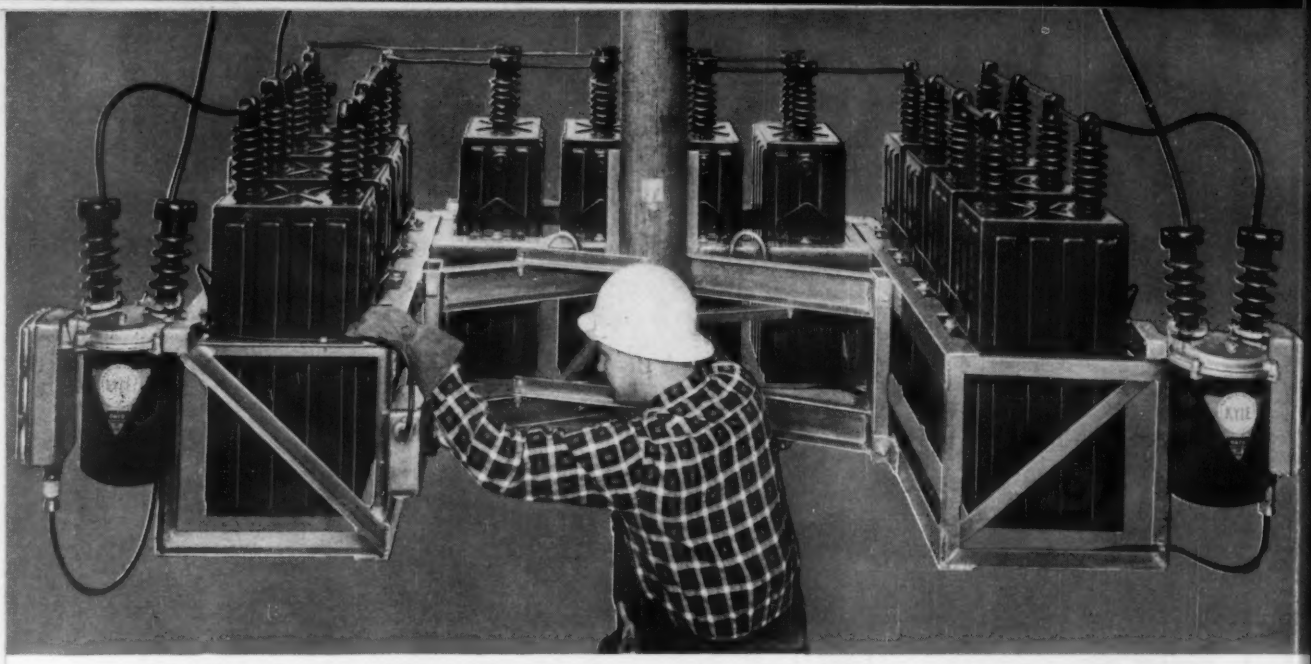
I WANT TO KNOW about Roeclamps with Associated Cables, so please send me your free book.

Name_____

Company_____

Address_____

City_____ State_____



CLUSTER-TYPE POLE-MOUNTED RACK, pre-wired, with switches, ready to install. Available in 600, 900, and 1200 kvar. Three frames are bolted to the pole mounting bracket and to each other. These racks may be hoisted in three sections, or may be bolted together on the ground and hoisted as a complete unit.

Here's L-M's Outstanding New Line of 100 kvar Capacitors, Equipments

L-M announces a revolutionary new 100 kvar stainless-steel Elemex capacitor which is smaller, lighter, more compact because of transformer-type cooling; a complete new line of corrosion-proof aluminum-alloy hangers, racks, blocks.

by **N. K. DELANEY,** Product Manager
Capacitors and Regulators
Line Material Industries

All 100 kvar capacitors announced to date present the utility man with a problem of excessive size and weight. To overcome this problem, Line Material research engineers have developed a revolutionary new capacitor design.

Cool . . . Cool . . . Cool!

In this new L-M 100 kvar capacitor, transformer-type liquid circulation makes possible a very substantial weight and size reduction, and keeps hot-spot temperatures even lower than in L-M's (or others') 50 kvars! The design provides cooling ducts in sides and ends of the tank. Elemex Liquid circulates freely up between the packs and down the sides, keeping temperatures low. Tanks are stainless steel with heat-radiating paint finish.

NEMA-Standard 15⅝" Mounting

The new Elemex is the only 100 kvar that meets NEMA-standard mounting dimension of 15⅝ inches—the same as 50 kvar and smaller units! This makes it possible to replace two 50's with one 100 kvar—*in the present rack.*

Full Line of Hangers, Racks, Blocks

A complete line of hangers, racks, and blocks has been specially designed for these 100 kvar units. All are light, strong, corrosion-proof aluminum alloy.

The line includes the following:

- single-unit hangers (100 kvar).
- 3-unit hangers (300 kvar).
- single-row pole-mounted racks for 300, 600, and 900 kvar.
- cluster-type racks for 600, 900, and 1200 kvar.
- block frames with ratings from 600 to 2000 kvar in 200 kvar increments.
- elevating structures

JUST LOOK AT THESE FIGURES!

Brand	Over-all Height	Tank Width	Tank Thickness	Mounting Dimension	Weight 2400 V 100 kvar
L-M	32 7/16"	13½"	9⅛"	15⅝"	185 lbs.*
Co. B	33⅛"	20"	7½"	22⅝"	270 lbs.
Co. C	33½"	25"	5½"	27⅛"	260 lbs.

**15% less per kvar than L-M's own 50 kvar.*

NEED WE SAY MORE?

Why Wait? Act Now! Discuss this new L-M 100 kvar Elemex Capacitor with your associates. Get in touch with the L-M Field Engineer right away—or wire or phone Line Material Industries, Milwaukee 1, Wisconsin, to reserve the supply you will need.

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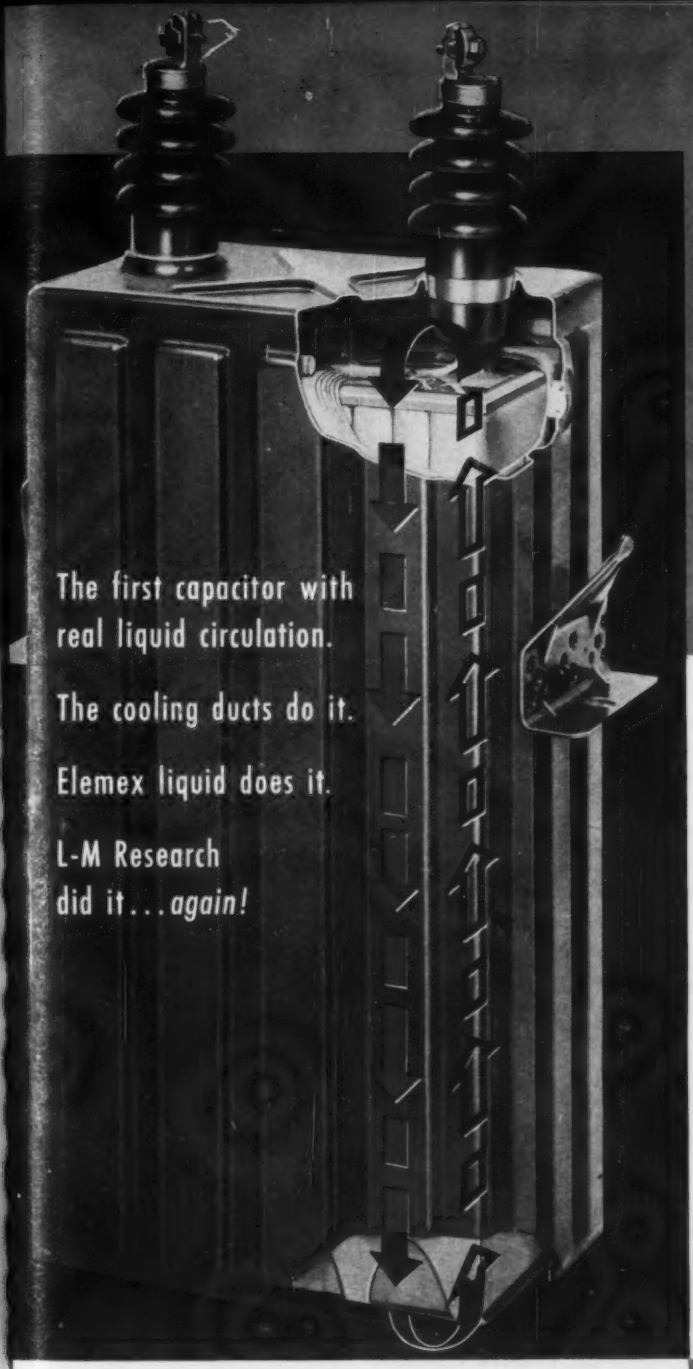
LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

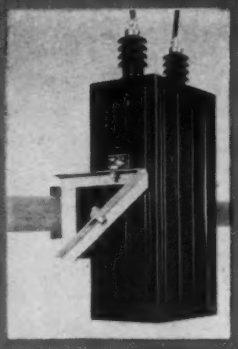


The first capacitor with real liquid circulation.

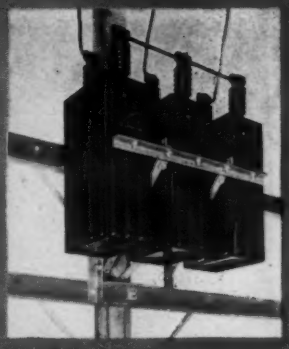
The cooling ducts do it.

Elemex liquid does it.

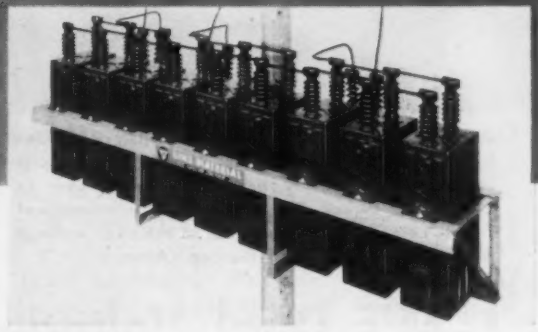
L-M Research did it... *again!*



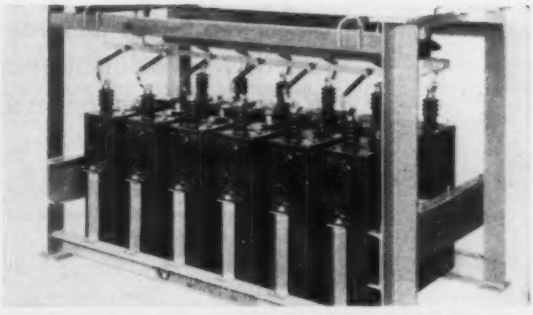
SINGLE-UNIT CROSSARM HANGER.



THREE-UNIT HANGER. All have ground clamp for either aluminum or copper conductor.



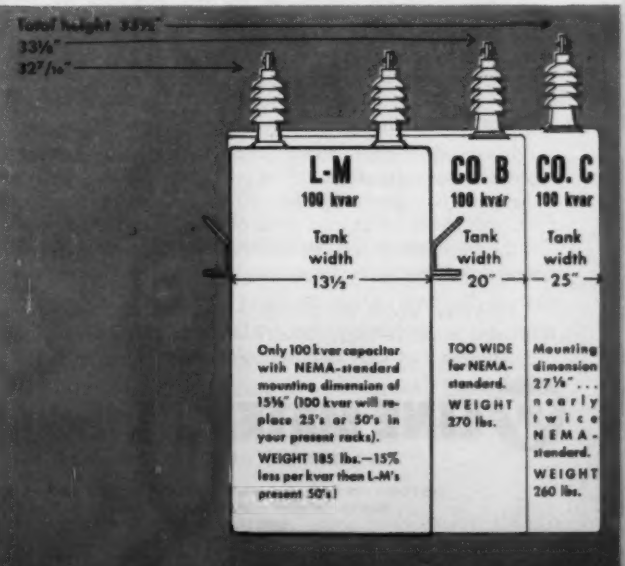
SINGLE-ROW pole-mounted racks are available for 3, 6, and 9 units—300, 600, and 900 kvar. All these racks are of welded construction. Galvanized steel pole bands (instead of using through-bolts) are an optional accessory.



BLOCK FRAMES are of all-welded construction, jig-assembled for accurate alignment. Ratings are 600 to 2000 kvar in 200 kvar increments. Fuses have 4000-amp. interrupting capacity each. Space saving averages about 25%, in comparison with blocks of 50 kvar units.

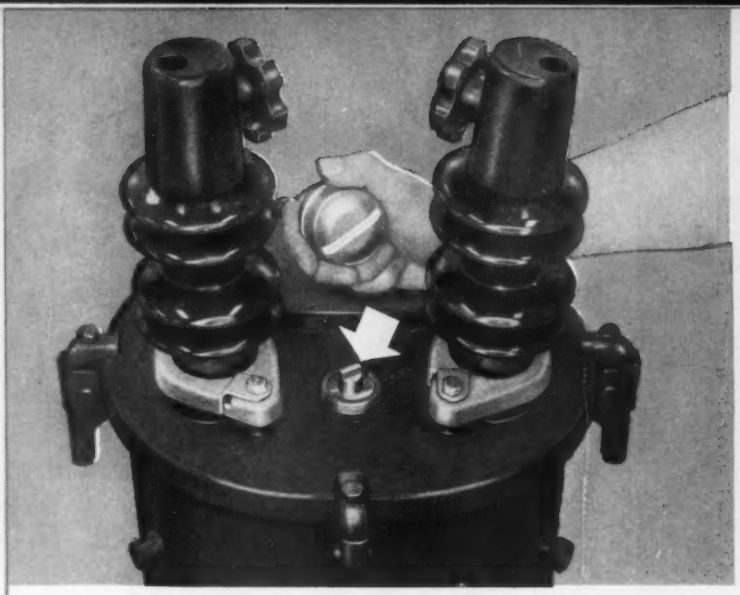
THE HOT-SPOT TEMPERATURE of L-M's new 100 kvar is even lower than that of 50 kvars, because of this new transformer-type liquid cooling. The Elemex Liquid rises between and around the packs, then goes down through the ducts and is cooled. The packs are cooler, because the heat comes out!

DIAGRAM shows how compact the new L-M Elemex capacitor is. Note also the weights. The lighter weight and narrower tank reduce bending moment on the pole, make capacitors and racks easier for linemen to handle and hoist.

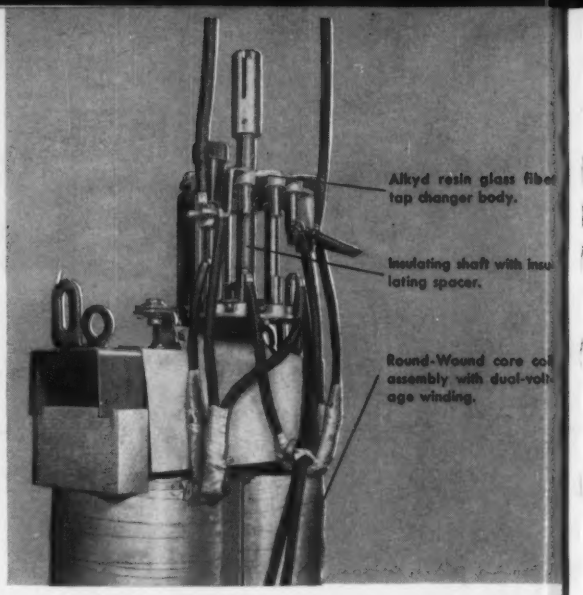


Elemex Capacitors

McGRAW EDISON



COVER-MOUNTED series-multiple switch control for L-M dual-voltage transformers. The aluminum cap is simply unscrewed by hand and turned over to operate the switch. The oilproof and weatherproof seal is completely independent of the cap. Voltage is clearly indicated under the cap. (Arrow)


Alkyd resin glass fiber tap changer body.
Insulating shaft with insulating spacer.
Round-Wound core coil assembly with dual-voltage winding.

L-M ROUND-WOUND dual-voltage core-coil assembly, showing the direct motion-transmission from the cover-mounted control through self-aligning stainless-steel shaft. The heavy-duty snap switch is built with the same time-proved components used in the trouble-free L-M tap changer.

L-M's Dual-Voltage Transformers Offer Cover-Mounted Switch, Round-Wound® Design

Cover-mounting provides direct control, better rigidity, with less danger of oil leakage and accidental damage. Round-Wound construction assures best possible performance.

By **DENNIS A. MANNING**
Manager, Transformer Sales & Service
Line Material Industries

L-M dual-voltage transformers offer some appreciable advantages to companies in the process of changing over to higher distribution voltages. When the change is definitely planned, L-M dual-voltage Round-Wounds make it possible to change the transformer from a lower voltage to a higher one simply by unscrewing the cap at the top and snapping the switch.

This reduces labor in cutting over; there is less down time, resulting in increased revenue to the utility and better service to the customer—certainly important advantages.

Some Disadvantages

In considering the installation of dual-voltage transformers, some disadvantages should be recognized. First, the cost of the units is higher than the cost of a standard transformer. Second, losses are at least those of the higher-voltage winding. If the transformer is to be operated at the lower voltage for a long time, these higher losses may be a factor worth considering.

However, where the change is contemplated within a reasonable length of time, reduced labor costs and elimination of down time may well be offsetting factors.

Many Advantages of Cover-Mounting

The cover-mounted L-M switch is an excellent feature. Vertical construction makes for excellent mechanical design. Motion is transmitted directly to the switch by a self-aligning shaft. This shaft is stainless steel, which prevents corrosion that could cause binding.

With the switch control in the cover, there is less danger of tampering, less danger of accidental damage, and less interference when mounting the transformer. The switch cap is more easily accessible to the lineman than a switch on the side of the tank.

Clear, Positive Indication

Only the voltage for which the switch is in position is seen on the top of the switch, so there is no possibility of confusion. For safety there are double stops, one internal, one external. It is not necessary to remove the tank cover to check switch position. Should the weatherproof cap be misplaced, no material damage will result, and switch is easily operated with a small wrench.

Let Us Supply Data, Details

L-M Round-Wound dual-rating transformers are available in various combinations from 2400 to 14,400 volts through 100 kva. Let us supply detailed information both on the design and on the ratings and sizes available. Ask the L-M Field Engineer—or if you prefer, write me at Line Material Industries, Transformer Division, Zanesville, Ohio.

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LINE MATERIAL Industries *Distribution Transformers*
McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON

Editorial Comment

APRIL 27, 1959

Standards Must Pace New Products

Utility construction standards today need frequent revision to incorporate improvements in materials and methods springing in swelling profusion from manufacturers' research and construction men's ingenuity. No longer can standards be limited to materials alone. Now they must include tools, working methods, and many other items formerly left for field forces to work out. Above all they must provide for quick, orderly exploitation of new ideas.

Almost every power company has a set of construction standards, designed to reduce the total number of hardware items necessary to specify, purchase, stock and apply. Imagine the chaos if these standards suddenly were eliminated in favor of carte blanche to engineer, foreman, lineman, operator and maintenance man to select precisely what item he wanted for each job.

Yet there's a long-term trend afoot which threatens the same effect. Standardization programs, often geared to quieter days, are not keeping pace with the volume of new products being introduced. Purchasing agents tell us the standards lists are being bypassed by provisional use of newly-designed hardware and tools, and the effect is reflected in need for warehouse space requirements exceeding those of normal business expansion.

The fruit of manufacturers' ingenuity must be tasted, of course, for therein lies the secret of holding the overall cost line. But the systematic achievements of standardization can't be abandoned. There must be prompt orderly trial and evaluation of the new product flow. The standards themselves must be revised continuously to permit full use of accepted items.

The job will be even more staggering tomorrow, for manufacturers' research bids to accelerate the new-product rate, and utilities must be ready to give these new items a fair trial in a systematic, efficient fashion. Only efficient, systematic application can capture the full advantage of the manufacturers' imagineering.

A Total Commitment

EEI's National Electric Living Program and Westinghouse's Total Electric Home are two bold, imaginative promotions which have helped throw into focus the whole matter of utility electric heating activities. They are today challenging those utility "prophets of gloom" who are using elaborate rate-research studies to "disprove" the economic value to individual companies of the all-electric home and electric heating.

It seems to us that, with few exceptions, "proving" by means of a detailed rate study that a company can't make money with the all-electric home is like "proving" by aerodynamic analysis that a bumble bee can't fly! The lesson, of course, lies in the fact that too many variables which do not lend themselves to calculation come into the picture. They are empirical, not theoretical.

The predictable problems caused by the all-electric home must be included in that larger set of problems which any utility must accept as part of growth itself. They will not come upon us overnight, and the time available to solve them is the same as it is for our other growth problems.

We are already committed to the all-electric home in some areas. Let us now commit ourselves totally.

New Wage Pacts Point to Average Increase Under '58

Settlements hinge on local conditions; Gulf Power Co strike heads into its sixth week

Protracted bargaining sessions may be in the offing as power companies, attuned to the dangers of inflation, and unions, hoping to repeat on last year's gains, gather material for contract negotiations during the remainder of 1959.

Judging from a small EW sampling of agreements reached so far this year and on comments from power companies, the industry's average increase apparently will wind up well below the nearly 5% average of 1958. This view isn't shared by the International Brotherhood of Electrical Workers. And, as one industry source points out, "It all depends on local conditions."

A case in point is the 5.5% increase granted recently to Southern California Edison Co employees. In an area largely untouched by the recession, where competition for skilled labor remains brisk, the Los Angeles-based utility entered negotiations without a stated offer, amicably declined the union's 7.5% original bid, then settled for a hike that represents a 14.5¢-an-hour package. The new contract is for two years and included in it is a 1960 wage reopening clause.

Deeper inroads of the business slump and lingering unemployment were reflected in the Northwest where Puget Sound Power & Light and Washington Water Power companies settled for 4.2 and 4.19%, respectively. The union initially asked for 10% from Puget Sound P&L. Negotiations were amicable, but the company did ask a federal mediator to sit in on the bargaining.

Officials of the International Brotherhood of Electrical Workers reported that wage settlements with all types of utilities are "heavily concentrated" around 5% so far in 1959. These negotiated increases come out at about 14¢ an hour.

IBEW Survey of All Utilities Indicates 5%

An IBEW survey, taken last week, covered 60 utility wage contracts reached in the first three months. Out of this, 39 showed 5% increases with the rest coming both above and below this average. The pattern compares with these other '59 IBEW division settlements:

Construction, outside—16¢; inside—15¢; radio-TV —11¢; and manufacturing—10¢.

Two major disputes—one in Florida and the other in Ohio—have not seriously affected service to customers except for some cases of sabotage to company property.

In the strike at Gulf Power Co, wages are not an issue. The company and union have agreed on "about a 5%" increase, a spokesman for the utility said. In a series of one-page advertisements run in service-area newspapers, Gulf Power says: "There is only one point at issue—the union's demand for control of certain key supervisory posts which Gulf Power Co insists are a part of management and should *never* be represented or controlled by *any* union."

About a dozen acts of sabotage have occurred since the strike began March 23. Some of the vandalism has resulted in service interruptions of up to ten hours and affected as many as 400 customers. Gulf Power has set rewards of $5,000 for information leading to conviction of the vandals.

Issue Referred to NLRB

The union contends that the company refuses to arbitrate the issue. The company's reply: "What is there to arbitrate? All but seven (out of 65 foremen) . . . have indicated their desire to be a part of management by continuing to work." The Taft-Hartley Act provides that no employer shall be compelled to bargain with a union in respect to supervisory employees, Gulf Power maintains. It has referred the matter to the National Labor Relations Board.

The walkout involves two IBEW locals, one in Pensacola and one in Panama City, representing some 350 workers.

On the other hand, a 36-day strike by IBEW members of Columbus & Southern Ohio Electric Co was linked directly to wages. Originally, the union sought 10¢ an hour for all line department classifications plus a 6% general increase under a wage reopening clause of a two-year contract. The company's first offer was 3.5%. Workers returned when negotiations resulted in a 4.667% increase, which represents an 11.9¢ an hour package. The 10¢-an-hour differential for linemen was not granted.

Meanwhile, Ohio's House bill 555, which would permit a 60-day restraining order against public utility strikes, is still "in reference." Sources in Cleveland say they expect the measure to remain pigeonholed because it's a "Taft bill" (introduced by Rep Robert Taft, Jr, Cincinnati Republican) and it faces powerful labor opposition.

How Recent Contracts Have Gone

Utility	% Increase	Cents/Hr Package	Years
Appalachian Power	4.5	——	3
Boston Edison	——	12.5	2
Cleveland Electric	——	12.2	1*
Consumers Public Power	4.6	——	1
Columbus and Southern Ohio	4.677	11.9	1*
Mississippi Power & Light	5	12.3	1
Monongahela Power	4.25	10.5	1
New England Electric System	5	10.9	1*
Puget Sound P&L	4.2	13**	1.5
Southern California Edison	5.5	14.5	1*
Virginia Electric & Power	4.75	——	1*
Washington Water Power	4.19	10	1

* Second year of two-year contract
** For journeyman lineman

REA Re-organization Clears House

Margin indicates opponents can't override expected veto. Criticism mounts on Clyde Ellis' role in passage of bill

The House passed the Price bill (HR-1321) last week, 254-131. The bill, aimed at removing all loan-review powers of the Secy of Agriculture over the Rural Electrification Administrator, is identical to the Humphrey bill (S-144) the Senate passed a week earlier (EW, April 20, p 22).

Opponents polled 34% of the House votes cast, but their strength adds up to only 30% of the total membership (436). However, there were ten more representatives who indicated they would have voted against the bill had they been present. This makes a total of 141 opponents, leaving slightly less than the required two-thirds needed to override an expected veto by President Eisenhower.

During the debate preceding the vote, political tactics of the National Rural Electric Cooperative Assn and Clyde T. Ellis, its general manager, were roasted on the floor of the House by Rep Ancher Nelsen (R-Minn.)—former REA Administrator—and Robert Barry (R-N.Y.).

Nelsen called NRECA a "propaganda front," which is "violating the trust that I and my neighbor farmers have placed" in it. "It is particularly tragic that we (members of Congress) should be subjected to these low-level propaganda tactics where facts are misrepresented and tuned to their (NRECA's) own fancy."

NRECA Pressure Noted

He continued, "Many members of this House have come to me on this very issue (REA re-organization), and a number of them have said, 'I dare not vote against this bill because they (NRECA) will make it appear that I am against rural electrification.' The facts will be distorted and twisted by the propaganda front, NRECA. I believe that . . . if we have reached the degree of fear where those who practice a technique of propaganda make us afraid to have an honest difference of opinion, then it is about time we look into a few things."

Nelsen narrated his own experiences with NRECA during last fall's elections: "I was tape-recorded time after time . . . Recorders followed me around in Denver like little red coaster wagons . . . NRECA personnel played parts of an Indiana

ELLIS NELSEN

speech, out of context, in New Mexico in the hope that I could be discredited by obvious misrepresentation . . . When they are so bold as to send telegrams into my district in political campaigns, when they are so bold as to write speeches attacking me for other men who are running for office to deliver, they are violating the trust that I and my neighbor farmers have placed in them."

Nelsen also charged that the REA re-organization bill, introduced by Rep Melvin Price (D-Ill.), "Is a phoney issue. I regret that a program so dear to the farmers of America should be continually placed in this political crossfire and be used in campaign after campaign."

Clyde Ellis' "individual effort" was the motivating force behind the REA bill, charged Rep Barry. He said, "I carefully examined the evidence presented to this committee, especially by those seeking the adoption of this bill. I refer you to the statement of Clyde Ellis . . . which appears in the record of hearings on this bill, and I ask you, after perusing this document, if this is not his individual effort wherein he has corraled the REA (co-ops) throughout the country to get behind this legislation, with more purposes than the particular issue at hand. Has this House and this Congress constituted itself as a body to determine who has the naked power to achieve his (Ellis') will, even though no gain may be reflected to the people?"

Private Power Attack Seen

Barry also charged that the purpose for the REA bill is "not at all what it purports to be. This bill is designed to be an opening wedge to let the flood gates down on the other complaints in Mr. Ellis' statement that the REAs throughout the nation would request of this or future Congresses . . . in order to more effectively compete and drive out private capital throughout areas that are now already supplied with private power and where ample capital is available to do the job without government subsidy, which in the words of Sen Taft, amounts to 'creeping socialism.'"

Rep Thomas Curtis (R-Mo.) criticized the House Government Operations Committee's report, which favored enactment of the Price REA re-organization bill (HR-1321), as follows:

"I do not believe I have ever seen a report from a committee of quite this nature, because the report itself takes up only about four pages plus, but then the bulk of this report seems to be a statement of Clyde T. Ellis . . . He is not a member of Congress."

Curtis asked, "Why would 11 or 12 pages of this report—and it is only a short report—be taken up with his statement? I have never seen a committee report of this nature."

Rep Clarence Brown (R-Ohio) added to Curtis' criticism:

"I do know that he (NRECA's Ellis) has been a very vehement witness in his testimony, yet he did not point out a single instance or submit to the committee a single bit of direct evidence, or even indirect evidence, that in any way the Secretary of Agriculture had interfered with the Director of REA in making loans."

LONDON ZOO is one use where silent operation, 33% lower operating cost of electric trucks compete with gas

FOR HOUSE-TO-HOUSE deliveries, electrics are termed ideal by Britishers; 28,000 are in use, mostly of this size

Electric Vehicles: Foreign Countries

Utility and transportation people in foreign lands are keeping a watchful, interested eye on U. S. developments in electric vehicles. But their reaction at this stage is decidedly cool, particularly on cars.

This is the impression gained by McGraw-Hill News bureau chiefs in five out of the six nations surveyed recently. The one exception is Mexico where demand for all kinds of vehicles is above the supply.

The "wait-and-see" attitude elsewhere on cars stems mainly from unsuccessful experiment in recent years with models that lacked adequate batteries.

In Britain there's a small, slowly growing market for electric delivery vehicles. These include house-to-house deliveries of foodstuffs, and services such as laundry and garbage collection. Small trucks are used in large manufacturing plants and on London's Thames' docks.

It seems unlikely, at least at this time, that British motorists will take to electric cars. This is attributable to the nation's classic enthusiasm for the internal combustion engine—despite the 70¢-a-gal cost for gasoline and 25% cheaper insurance rates for electric vehicles. There have been several attempts to introduce electric cars but these have died natural deaths. Latest effort is the "TEL" sedan being made by Traction Electric, Ltd (EW, April 6, p 45). This car may stand a better chance of survival because it is powered by a lightweight battery claimed to be a major advance over conventional lead-acid types.

Battery limitations have restricted Britain's use of electrics to users who make short runs in a limited area. "When a really revolutionary, cheap, lightweight battery with stamina is made," one truck maker says, "it'll be a major breakthrough, and our market potential will be limitless."

Battery makers since 1946 have increased capacity space ratio by 25% and are hard at work on the weight problem. As for costs, a 72-v, 226 amp/hr (at 5-hr rate) battery is $840. One of the largest traction batteries, installed in the National Coal Board's biggest locomotive, is 200-v, 500 amp/hr model costing $4,000.

Makers of rectifiers have been making improvements, also. They've introduced automatic charge time relays which recharge batteries to the exact amount and switch off at end of charge. Experiments are under way on silicon rectifiers to increase efficiency.

There are about 28,000 electric vehicles on Britain's roads, 24,000 of which are small trucks of up to two tons. About 2,000 units are sold a year, and saturation limit has been estimated at 40,000.

Smith's Delivery Vehicles, Ltd, and Austin Crompton Parkinson Electric Vehicles, Ltd, are the largest of ten firms making electric vehicles in Britain. Excluding battery and charger, prices for trucks range from $2,240 for a one-ton unit to $3,080 for a two-ton model. Truck owners can rent a battery for about $300 a year, depending on size.

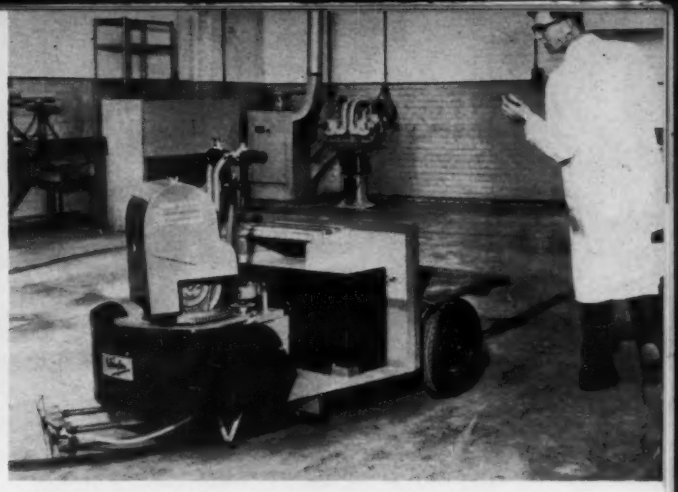
Of the 5-million or so cars, trucks and buses in France today, slightly less than 5,000 are powered by storage batteries. Only one electric truck manufacturer is in business; he averages about 50 units a year.

French Trucks Noted for Longevity

Although few in number, electric trucks in operation are notable for their longevity. About 650 built before the war are still in service. And nearly all of the 4,000 postwar units are making daily rounds today. About 800 electric cars were built during the war, and only four or five of these are still running today.

About 85% of trucks made in France have 7-metric ton capacity; 3.5-ton trucks account for the balance. The majority of these go into municipal service. To put a 3.5-ton truck in the garage, city fathers must pay $4,700 of the taxpayers' money. The 3,300-lb batteries add another $1,120. This for a vehicle with a 50-mi range and a top speed of 14-17 mph. The 7-ton models cost $7,450 and batteries are $1,420.

LARGEST OWNERS of electric fleets are London cooperative societies. Britain's vehicles use 250-million kwhr a year



ROBOTUG is latest British Railways wrinkle. Electronically controlled it follows electric wire, can operate on battery

Are Cool on Idea

Japanese who know about battery-powered vehicles agree there is no market for electric cars or trucks. They explain that Japan was making electric cars, buses and trucks during gas shortages shortly before and after the war. In 1949, 1,222 electric cars were produced. By 1951, the year when gas controls were lifted, the total was 86 cars. Highest output of trucks was 420 in 1947.

Japanese observers said the cars' noiseless motors, smooth operation and low running costs were well liked but that these factors were outweighed by low efficiency. In a land where flat terrain and good roads are at a premium, the electric faced insurmountable odds. Even with radical improvements, makers of electrics would face a tough selling job in Japan.

Mexicans, on the other hand, are enchanted with the idea. They believe they could sell models as fast as they could be imported or made locally. Supply of all cars is far behind the demand, so utility and transportation-linked people are anxious for more information on the electric.

One Mexico City auto dealer said a locally made electric, priced low enough, would be guaranteed sales for the "next 50 years."

Electric cars have stirred little interest in Venezuela, mainly because of their limited range, but there may be a small market for delivery trucks. The truck interest hinges, however, on a price not too far above comparable combustion-engine models. Trucks for laundry fleets now cost under $4,000, so electrics probably would have to stay under $4,800, including batteries. Two big drawbacks are 1) an 11.3¢-a-gal cost for gas and 2) a 4¢-a-kwhr off-peak rate for power.

Prospects are nil, also, in West Germany where a 1955 prohibitive road tax on electric vehicles has squelched all interest. Roughly 20-million kwhr of electricity is purchased a year to recharge batteries of vehicles not using public roads.

FRENCH BID for car market is Prof Henri Andre's converted sports car. Its costly silver-zinc battery gives 150-mi range

SMALL OUTPUT of trucks in France is concentrated on 7-ton models. Nation's recharging load is 68-million kwhr

'MAGIC CARPET' BALLOON, 100 ft long, is suspended from ceiling. Seeming to soar through the air, it highlights Cincinnati Electric Living Exposition theme for '59: 'Electricity . . . Magic Carpet to Comfort'. Show drew 81,000 people

Cincinnati G&E Stages 'Magic Carpet' NEW Show

RONALD REAGAN, host on the General Electric Theatre, received 'Most Electrifying Personality' plaque in recognition of his efforts on behalf of electrical living

Probably no electric utility celebrated National Electrical Week more extravagantly than Cincinnati Gas & Electric Co. The pictures on this page give some indication of the extent to which CG&E went to put NEW across. The man primarily responsible was Sales Promotion and Merchandising Director E. W. "Ed" Hodgetts. After deciding on an Arabian Nights motif and a suitable theme ("Electricity—Your Magic Carpet to Comfort"), Hodgetts built a giant 100-ft "Magic Carpet" balloon and an "Open Sesame" cave in the Cincinnati Gardens to highlight the Electrical Exposition for 1959. In addition, two 20-ft genies, an appliance contest and 140 booths with 1,001 appliances helped draw a record crowd of more than 81,000 people. But the best measure of the show's success was summed up by an exhibitor who said, "It was terrific . . . lots of sales and prospects . . . where can I sign up for the next one?"

'QUEEN ELECTRA' indicates Electrical Exposition theme

BUILDING is well lighted to attract visitors' attention

Industry Leaders Set Goals at SEE

Furr, Corette, Singleton, others cite goals for electric heating, public relations, organizational cooperation, atomic power

The Southeastern Electric Exchange held its 26th annual conference March 23-25 at Boca Raton, Fla. Utility and manufacturing executives explored the theme: "Planning Future Power Needs Southeast."

G. L. **FURR,** V. P. and Gen. Mgr., Appalachian Power Co.

Urges Industrial Promotion Through Area Development

"Some of the electric manufacturers, and the utilities, are doing a real job in developing and promoting electric heating. This is one of the bright spots in the future of our industry and its possibilities are almost unlimited.

"But I believe the big challenge our industry must face today is Area Development . . .

"We have found that industrial prospects are fairly easy to locate. We, ourselves, have had little difficulty in becoming accepted as an organization which can provide statistical and descriptive information that is accurate and helpful. But we are beginning to discover that we are sadly lacking in enough desirable communities to bid successfully for a majority of industrial prospects which have come to our attention recently.

"This has brought most companies to the realization that a comprehensive community development program is a necessity if we are to realize success in a long-range industrial development program . . ."

Says Business Is Remiss in Telling Public of Favors

"Nationwide, the REA has completed its original job, has abandoned the concept of its creation and has become probably the most serious major competitor of investor-owned utilities . . . REA's should be limited in their activities to the purposes for which they were created."

"The users of the facilities of investor-owned electric companies, which constitute 71% of this nation's investment in electric facilities pay 97½% of taxes from electric properties and operations . . .

"I am convinced that American business has not been doing anywhere near an adequate job of informing the American people of the benefits of the American business."

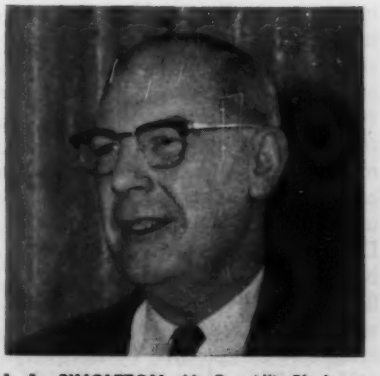
J. E. **CORETTE,** President, EEI and President, The Montana Power Co.

Cites Fruitful Cooperation of NEMA, EEI, Others

"Since the interests of NEMA and those of the electric utility industry are so closely allied, it is only natural that many of NEMA's activities are carried on jointly with the utility industry through EEI and other utility organizations. Examples of this joint activity are the adequate wiring promotional programs for both residential and commercial wiring, the appliance promotional programs covering dish washers, ranges, water heaters, freezers, etc., overall industry promotions, such as National Electrical Week, and the cooperation in many technical standards covering products used by the utility companies. It could be said that NEMA actually works for the utility industry.

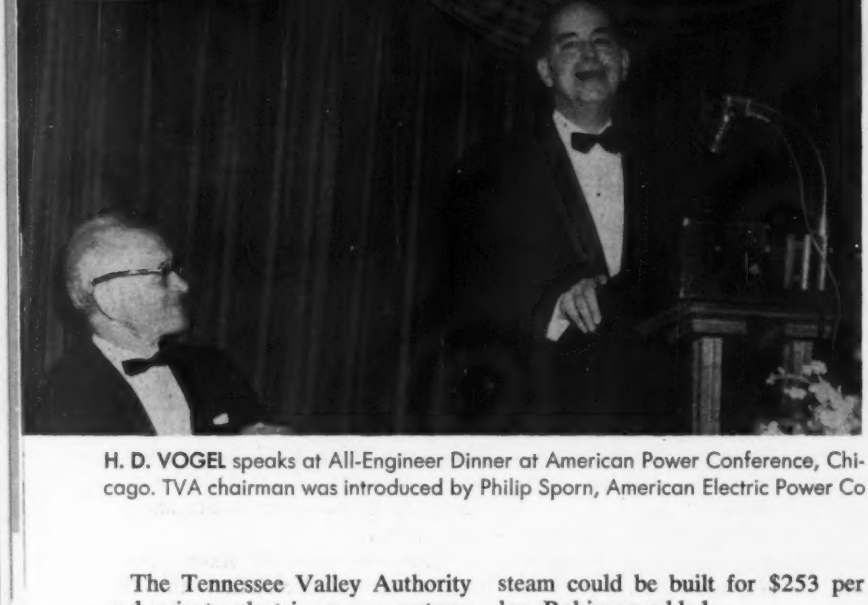
"A good example of this product standardization is the work done by the EEI-NEMA joint committee for the standardization of distribution transformers. This committee has been in operation for more than

(*Continued on page* 99)



J. L. **SINGLETON,** V. P., Allis-Chalmers Manufacturing Co.

Vogel Talk



TVA chairman presents American Power Conference with denial that public agency, private power systems are mutually threatening

H. D. VOGEL speaks at All-Engineer Dinner at American Power Conference, Chicago. TVA chairman was introduced by Philip Sporn, American Electric Power Co

The Tennessee Valley Authority and private electric power systems can grow side by side without threat to their financial future or freedom, H. D. Vogel, TVA chairman, told the American Power Conference recently in Chicago. "Each," he said, "must recognize the rightful and enduring place of the other."

In defending TVA's recent purchase of a 500-Mw turbogenerator from a British manufacturer, Vogel declared: "Bids from domestic concerns were nearly 50% higher." And he told engineers in general to combine "vision with technical talents."

Joint action of the engineer and the accountant helped Commonwealth Edison Co to meet growing customer demands economically, reported Murrey Joslin. A measure of their joint contributions, he said, was the completion of the 315-Mw generating unit for $137 per kw, earlier plants having cost up to $223 per kw.

The pebble-bed reactor, cooled by helium, produces high-pressure, high-temperature steam to drive a modern turbine, said S. T. Robinson and R. F. Benenati, Sanderson & Porter. With graphite spheres impregnated with U-235 as fuel elements, the PBR promises low fabricating cost and simple continuous unloading and refueling under load. Design contemplates a surrounding blanket of Th-232 which breeds to fissionable U-233, enough being available eventually to permit operation on inexpensive Th-232, they said. A PBR plant driving a 125-Mw turbine with 1,450 psi/1,000F steam could be built for $253 per kw, Robinson added.

Nuclear boiling offers attractive heat transfer in an organic cooled reactor, said Ralph Balent, Atomics International. Boiling can be accomplished by primary system pressure giving saturation at a temperature below that of fuel elements, either metallic uranium or uranium oxide. Total power cost of a large plant of this type should be about 9 mills per kwhr, he added.

Water Needs Care

Boiler water treatment for the Shippingport pressurized-water reactor plant resembles that of a 600-850-psi conventional plant, said S. F. Whirl, Duquesne Light Co, and W. J. Singley and I. H. Welinsky, Westinghouse. Austenitic stainless steel in the heat exchangers requires special care to avoid stress corrosion cracking. Although neutralizing the primary coolant to about 10.0-ph water with lithium hydroxide helped to avoid such cracking, they said, the temperature was lowered from 523F at 2,000 psia to 500F at 1,800 psia after several heat exchanger tubes developed leaks.

A non-catalytic reactor design with two or more coolant loops and independent methods of removing delay heat provides a nuclear power plant that can be operated as safely as any other industrial plant, said R. H. Shannon, United Engineers & Constructors Inc.

Development of seven basic 3,600-rpm turbine elements and a few for 1,800-rpm low-pressure sections will help manufacturers to supply the utilities' projected needs, said H. R. Reese, Westinghouse. These elements can be arranged in single or double-shaft combinations to accommodate a range of ratings and steam conditions up to 750 Mw at 3,500 psig 1,050F and 1,000 Mw at 6,000 psig, 1,200F. Where units larger than 800 Mw are required, Reese proposed triple-shaft assemblies of the same elements.

Advantage of the new concept, he said, is the ability to order and machine duplicate sets of major castings and rotors, thereby providing cushion against possible rejects and assuring shorter delivery schedules.

Much turbine-generator progress in the next decade will be simplifications, improvements, and extensions of present designs, said E. H. Miller and B. M. Cain, GE. Tandem-compound turbines up to 500 Mw appear possible during the 1960's but maximum economy may be attained closer to 400 Mw, they said. Steam conditions are expected to be 3,500 psig and 1,050/1,050F.

Operation of the Philo supercritical unit is fulfilling its purpose most satisfactorily, reported T. T. Frankenberg, A. G. Loyd, and E. B. Morris, American Electric Power Service Corp. Its availability during the second year was 77%, a gain of 27.5% over the first year, and average net generation climbed 22% to 95.1 Mw. Both gains were largely attributable to improved reliability of the feed pumps, he said.

Developments in the second year were: Discovery of copper deposit in the HP turbine, checked by a

Power Conference Highlight in Chicago

change in feedwater treatment; detection of excessive bearing thrust, corrected by planned elimination of HP rotor cooling and blade modifications; cracking of welds in stainless steel piping and between dissimilar metals, corrected by modifying attachments and relocating joints; and, erosion of stop-valve seats, corrected by insertion of new, replaceable seats.

Operation of the subcritical, once-through boiler at Dayton P&L Co's Tait Station showed excellent performance of the feedwater control system during severe load drops, reported J. D. Williamson and R. F. Andres. Under such conditions, steam is diverted to the bypass system with pressure maintained for quick restarting of the turbine.

The subcritical once-through steam unit at Metropolitan Edison Co's Portland Station affords reliable operation of the control system, reported J. S. Bartman and J. G. Miller. Yet its full potential for rapid starting and loading has not been used.

Steam pressure was set at 2,400 psi after the 165-Mw rating was found to be too low for 3,500 psi, they continued. Pressure is boosted to 2,520 psi to gain capability after turbine inlet values are full open, but steam temperature is held to 1,050F to avoid austenitic piping.

Control of once-through boilers is more direct when fuel and air inputs are regulated by generator output and the throttle regulates steam pressure, said E. D. Scott, Leeds & Northrup. Such a system regulates unit output in an orderly manner and keeps it within the capabilities of boiler and auxiliary equipment.

Alternative approaches to low-cost plants for utility peaking service, built around gas turbines and diesel power generating units, were presented. A gas turbine peaking plant, costing 15 to 30% less than a steam plant of like kva, and that can be installed in 90 to 120 days to operate at a thermal efficiency of 22%, was described by A. O. White, R. J. Carpenter, and W. D. Marsh, GE. The plant is built around a simple-cycle, single-shaft gas turbine with a 1,600F firing temperature, rated 20,500 kw with 80F inlet temperature at 1,000-ft altitude. The unit is a modification of a similar turbine rated 16,500 kw for continuous operation, that has a firing temperature of 1,450F. The increased firing temperature, which brings an 8% increase in capacity for each 50F rise, is considered conservative in the light of the limited hours of operation at reduced load that the unit would experience in peaking service, the authors said.

An automatically operated 6,000-kw packaged diesel plant, consisting of three 2,000-kw engine-generator units controlled from a central unit, was desribed by B. B. Brownell and B. H. Hefner, Electromotive. Designed for unattended operation, the plant can be put in service in 90 sec. Installed cost is estimated at $100 per kw.

Experience with three types of systems for scheduling and control of generation on interconnected power systems was reviewed at a symposium chairmanned by Nathan Cohen, Leeds & Northrup.

Computer-Control Cited

The first "desired generation" computer-control that automatically allocates generation changes for lowest overall incremental cost of delivered power and determines optimum loading for other than existing conditions, has been operating successfully since September 1958 on the Southern California Edison system. The design, using an analog computer, was described by L&N engineers Foreshetian, Liechty and Brown.

Automatic dispatching by the Connecticut Valley Power Exchange has brought an annual saving of $30,000 to $35,000 due, in part, to economic loop action and elimination of inadvertent power interchange, H. H. Mochon reported. Without control, the range of area requirement was −10 to +16 Mw. With control, the range is normally ±5 Mw. On an hourly integrated basis, error is rarely over ±2 Mw, he said.

W. D. Wilder reported as generally satisfactory the operating experience with Niagara Mohawk's command-type load-frequency control system. The system provides governor speed motors with continuous signals proportional to the load change required on the net tie. It controls output of ten steam units in three stations having a capacity of 1,180 Mw. Wilder described as "outstanding" the component device that limits the rate of load change and protects against unwanted load swings.

In Russia some 1,750 circuit miles of 400-kv transmission line is being converted to 500 kv, and a new Stalingrad-Moscow 500-kv line is being built. Decision to operate the 1,800-kv line insulation at 500 kv on the new and converted lines was based on tests that showed switching surges would not exceed 2.5 times normal line-to-ground voltage.

Details of the Russian designs were revealed by B. P. Lebedev, USSR Ministry of Power Stations, S. S. Rokotyan, and I. A. Siromyatnikov. The 400-kv circuits—two from Kuibishev to Moscow, and one from Kuibishev to the Urals—have 25% series compensation. But on the new Moscow-Stalingrad line, compensation was deemed unnecessary. A circuit capacity of 750 Mw and higher is sought for the new 500-kv circuit. Tests have established capacity of the compensated 400-kv lines at 720 Mw for a single-circuit line of 500 miles, Lebedev reported.

Quebec Hydro-Electric Commission's 1,300 circuit miles of 300-kv transmission, linking the 960-Mw Bersimis hydro project with Montreal, has suffered losses due to snow of upwards of 60 kw per mile and charging requirements of 100 Mva. When first energized and while one 300-kv circuit was loaded and the other on buildup, operators found that 4,000 to 5,000 kw of power could be transmitted from the lightly loaded to the loaded circuit, apparently through the electrostatic capacity of both. At the power plant the synchroscope showed the lines to be 90 deg out of phase.

Use of 345 kv on the Ohio Edison system was preferred to 138 kv to enable larger power blocks to be delivered over upwards of 100 miles using limited rights-of-way, Lynn

Firestone and E. A. Rothfus reported. Minimum r/w requirements are established as 150 ft for a single-circuit, 200 ft for a double-circuit line.

Development of a cable system of great power transmission capabilities is today's primary challenge to the cable industry, said C. S. Schifreen, Philadelphia Electric Co in calling for coordination of research among utilities, cable manufacturers, and insulating material suppliers.

Four-years' experience with two 110-kv bundle conductor lines by Carolina Power & Light Co has exceeded expectations, E. H. Erlandson reported. No trouble occurred on either flexible or solid-type cable supports, vertical or horizontal. But, the vertical type is preferred, as it does not reduce ground clearance. Sleet melting is more difficult with bundle than with single conductors, Erlandson said, because surface area of bundle conductors is greater. He said spacers were unnecessary in spans of 520 to 1,200 ft for wind velocities up to 135 mph and fault currents of about 3,000 amp.

SF_6 Breakers Proved

G. J. Crowdes, Simplex Wire and Cable Co, described a 35-kv polyethlene-insulated overhead-underground distribution cable line a half mile long which has operated successfully for two years, carrying up to 13,000 kva. First of its type in the U. S., it comprises three single-conductor, 350-MCM cables installed for $3.60 per kva-mile, 3-phase. Designed for 20,000 kva the three 2-in. cables when cabled together have a diameter of 4.2 in.

Air-blast circuit breakers are ready for high-capacity American transmission systems up to 460 kv, said W. R. Wilson, GE. He claimed that the new designs will cut inspection time 75% and foundation costs 80%, and, by eliminating fire hazard, lead to roof-top and structure mountings saving ground space.

Sulfur-hexafluoride breakers are suitable for up to 460 kv, said R. E. Friedrich, Westinghouse. Experience with units installed two years ago demonstrated improved performance, minimal maintenance, and quick access for inspection.

Continued development has incorporated the vacuum switch into a compact light-duty circuit breaker, reported J. W. Rittenhouse, Joslyn Mfg Co. Modular design provides ratings from 34.5 to 115 kv which can clear faults up to 800 Mva in 1.5 cycles. It combines routine switching and fault protection for a 10-Mvar capacitor bank.

Field tests of a 15-kv vacuum switch demonstrate its suitability for switching a 5-Mvar capacitor bank, reported G. N. Lester and H. M. Pflanz, Allis-Chalmers, and H. B. Balfour Jr, Louisiana P&L Co. It has operated daily since January 16 to regulate system reactive level.

G. G. Fryder, Commonwealth Edison, and J. G. Snyder, AEP, reported on commercial and industrial installations of electric heating in the areas of their respective companies. An installation in Chicago's Building Service Center permitted elimination of boilers and associated equipment from an area that was then converted into a meeting room which rented for more than enough to pay the additional cost of electric heating. The world's largest heat pump, 900 hp, in the Flick-Reedy Corp building, Bensenville, Ill., will heat and cool 220,000 sq ft of office and plant area.

Sell electric heating because it is better, and the American people are always looking for better things, urged Snyder. Denying that it is too expensive, Snyder said that there is no added cost for operating fans, blowers, and motors, no annual cleaning and inspecting costs, and no replacement cost after 15 years. He reported that AEP had 1,474 electrically heated homes on its lines at the end of 1953 and 14,266 at the end of 1958. AEP's goal, he said, is a 25% saturation by 1975, or 500,000 homes.

New heating loads will bring changes in Commonwealth Edison's direct-buried cable type residential distribution, said D. R. Jenkins. Plans provide for larger transformers in vaults or on concrete pads and shorter secondaries. Transformers will serve only eight customers. He reported that buried cable is being developed for 7.2/12.4-kv circuits.

Too many engineers think of improved service as a distribution system so weak it must be propped up by emergency measures, said C. E. Flahie, Toledo Edison Co. Such a philosophy might be called negative dependence.

Mechanical strength of conductors is only one factor in determining conductor size. A home-grown rule for determining proper conductor size is "greatest economy of conductor size with a growing load and is achieved when the thermal limit is at the 'head' of the circuit and voltage drop limit at the 'tail' at the same time."

Reliability of service is the major consideration in the design and pur-

Soviet Guests

Attending and participating in the American Power Conference, as sponsored guests was a four-man delegation of power system engineers from the Soviet Union.

Headed by B. P. Lebedev, electrical engineer of the USSR Ministry of Power Station Construction, the group also included Dr V. V. Burgsdorf, the head of the Network Laboratory of the Central Research Electrotechnical Institute; I. A. Siromyatnikov, professor of the Power Institute of Moscow, and L. K. Kudriavtsev, construction engineer of the Ministry of Power Station Construction.

During their stay the Russians discussed power system developments in the USSR with Electrical World editors at length. What follows in convenient Q. and A. form are responses of the group to many questions addressed to it. The answers are not quotations but the sense of replies by the group to similar questions.

Q. *Your APC paper reports plans to convert your 400-kv lines to 500-kv. When do you expect this to be completed?*

A. Changeover of the two 500 and 550-mile, 400-kv Kuibishev-Moscow lines will take until 1962 because of the need to rewind some transformers and reactors for 500 kv. Other 400-kv transformers can be reconnected. This year we will complete a newly-designed 500-kv Stalingrad-Moscow line. Like the earlier 400-kv design, it will have triple-bundle conductors and a critical impulse insulation level of 1,800 kv but not the 25% series compensation of the Kuibishev 400-kv lines.

Q. *What switching surge value have you experienced on your 400-kv system?*

A. During 1955-56 we made exten-

chase of equipment for power plants that serve industrial processing plants, said R. W. Precious, Union Carbide Olefins Co, and R. H. Emery, St. Regis Paper Co. Emery reported that shutdown of one mill would cost $41,000 a day and that for the mill an expenditure of only $33,000 was justified for a 1% increase in efficiency of the power plant serving it.

Precious said that in planning the power plant to serve a process industry the first step is to determine the relationship of process steam requirements to power requirements. A good steam and power balance, prepared in cooperation with the process engineers, determines the power plant characteristics, such as initial steam pressure and temperature, and exhaust pressure and temperature, the authors continued.

The trend in heat balances for power plants serving industrial processes is to higher initial pressures and temperatures, said M. E. Ferson, GE. It is also toward larger sizes in turbine-generator units, he said. High reliability of modern equipment minimizes standby requirements and permits larger units.

# of APC Tell of Power System Developments

sive system tests on the 400-kv Moscow lines. We established that switching surges would not exceed 2.5 times normal line-to-ground voltage under the most severe conditions. This finding influenced our conversion to 500 kv.

Q. *What is the order of the lightning outage performance on your 400-kv lines?*
A. This year on the 550-mile Kuibishev-Moscow 400-kv line we experienced only two lightning outages, a little less than 0.36 per 100 miles per year. We use two shield wires and a protection angle of 20 deg on towers of about 100 ft.

Q. *What was your experience with galloping conductors on EHV lines?*
A. We are studying galloping conductors in a wind tunnel using aerodynamic tube models of transmission conductors to determine the lifting force on conductors under various icing conditions. We have experienced galloping amplitudes approaching 3 meters (9 ft) on actual lines. We have observed that conductors heavily loaded with ice do not gallop, and that we do not get galloping in hilly country. Our maximum ice loads apparently approximate yours here, about 20 lb per ft of conductor.

Q. *Have you experienced trouble with icing of overhead ground wires?*
A. Yes. This year particularly. We have accumulated up to 6 in. dia of heavy wet snow on steel ground wires which in some instances stretched them down into phase conductors. The possibility of sleet and snow melting on ground wires by insulating the ground wire from the towers is being considered.

Q. *What is the present status of your Stalingrad-Donbas dc transmission line project?*
A. Construction of this 800-kv (±400 kv) dc line is scheduled to start this year and be completed in 1962. It will be upwards of some 300 miles long and have a capacity of 750 Mw.

Q. *What is the capacity of your existing 400-kv ac lines?*
A. We are regularly transmitting 1,200 Mw over the two Kuibishev-Moscow lines and about half that over the 460 mile Kuibishev-Ural line. There is a 2-hr time differential between Moscow and the Urals to the east, so we can transmit power to the Urals early in the day and to Moscow later. Specifically, we can transmit 600-650 kv 550 miles at 400 kv. We hope to transmit 750-800 Mw 621 miles at 500 kv.

Q. *What are the prevailing voltage systems in use in the Soviet Union?*
A. There are eight transmission and distribution voltages in use today. They are: 3, 6, 10, 35, 110 (154), 220, 330 and (400) 500 kv. We are dropping 400 kv, and 154 kv is disappearing. With the shift from 400 to 500 kv we have recently added 330 kv to meet transmission needs between 220 and 500 kv.

(*Continued on page* 104)

Kudriavtsev Siromyatnikov Burgsdorf Lebedev

Rig Pulls and Cuts Cable Automatically

C. B. **BECHTEL**, Senior Engineer, Underground Division,
J. R. **KEENE**, Engineer, Electrical Engineering Dept, Baltimore Gas & Electric Co, Baltimore, Md.

A trailer-mounted machine developed by engineers of Baltimore Gas & Electric Co automatically pulls cable from underground ducts, cuts it into short lengths, and stacks it ready for hauling away. It reduces the cable-pulling crew from eight men to five and completes both pulling and cutting in the same time formerly required to pull cable alone.

The machine consists of a 30-hp air-cooled gasoline engine, hydraulic pump, hydraulic pulling cylinder, cable-pulling grip, guillotine-type hydraulic cable cutter and hydraulic and electric valves to control operations. All equipment is mounted on a three-wheeled trailer.

The trailer is towed to the site, rigging is set up in the manhole and the cable is fed into the machine using wire rope and a wire puller attached to the pulling cylinder. After the wire puller is replaced with a cable grip, the machine pulls cable from the duct and cuts it into 4-ft lengths in a continuous operation.

Trailer construction consists of a 4-in. channel bed mounted on a standard axle and tires, a 6-in. steel I-beam and a light structural steel frame.

The trailer pulls and cuts cable into short lengths at the rate of about 10 ft per min. It will handle cable in sizes up to 3½ in. in diameter.

Seal Time Switches and Meters with Multibar Seal

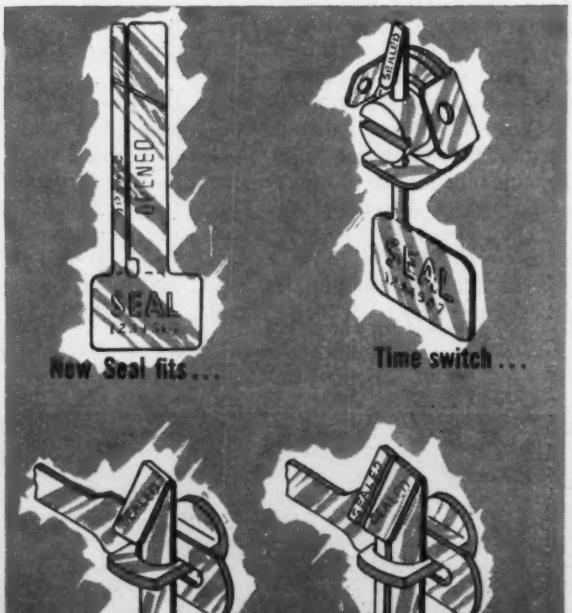
H. H. **KOCH**, General Meter Supervisor, Ohio Edison Co, Akron, Ohio.

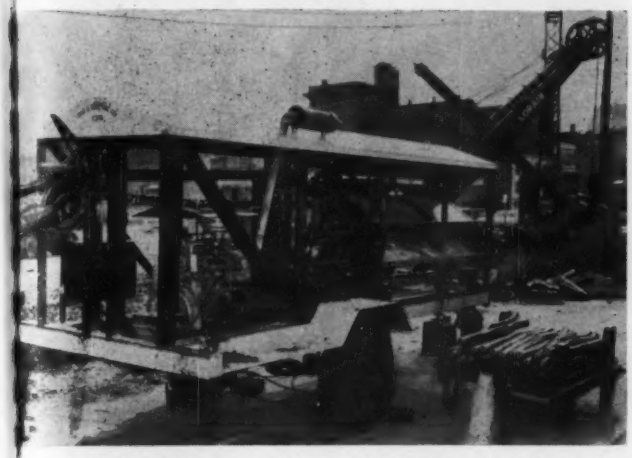
One type of seal is being used by meter readers of Ohio Edison Co to seal watthour demand meters and time switches. This device, a multibar seal, was developed in cooperation with E. J. Brooks Co. The seal may be installed with one hand without the use of a sealing tool and is self-destroying if tampered with.

The multibar seal is used in the access port of the covers of time switches and in the reset mechanisms of watthour-demand meters. The hole in the access port on the switches generally is of small diameter, while the openings in the makes of meters used generally are of two larger effective diameters.

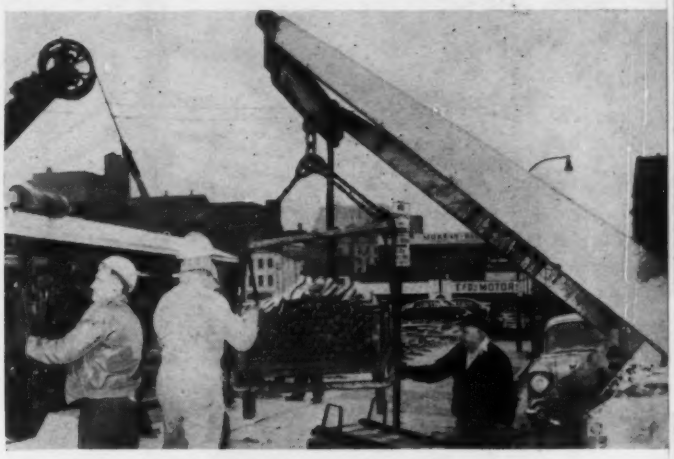
To meet these three conditions, the seal is designed so that one or the other of two bars of different widths or both bars will provide three different widths. The ends of the bars are bent back to prevent the seal from being removed. The bent portion will break off during an attempt to straighten the bar. In using the multibar seal, it is necessary only to break away the proper bar (or none at all), insert the seal, and bend the end portion.

Ohio Edison has installed over 200,000 seals of this type. Cost of the device is comparable with that of other types of seals. However, other types cannot be used as readily in all of the applications for which the multibar seal was developed.





PULLING RIG cuts cable into 4-ft lengths and stacks sections on pallets. It will handle cable sizes up to 3½ in. diameter



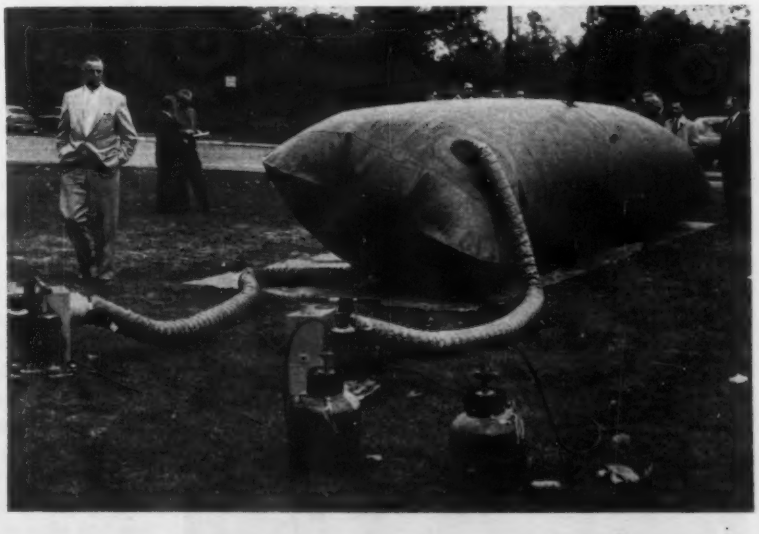
PALLETS ARE TRANSFERRED to truck for disposal. Crew is reduced from eight to five and working time is cut

Collapsible Tank Stores Oil During Repairs

A collapsible oil storage tank currently being tested by the Hydro-Electric Power Commission of Ontario is expected to reduce the cost of transformer and circuit breaker repairs. The rubber tank eliminates the need for a tank truck or the alternative of filtering the oil into drums when repairs are to be made.

Complete with ground cloth, the 5,000-gal tank weighs only 385 lb, and it is compact enough, when folded, to place in the back of a small truck for transportation to the site. Rubber containers of this type are made by Goodyear Tire & Rubber Corp, US Rubber Co, and Dominion Rubber Co (Canada). The tank is equipped with special fittings that permit easy coupling of the oil lines. A small portable pump transfers the oil from the transformer or breaker and returns it.

The possibility of using tanks for transportation of oil when transformers are being moved is also being investigated. In most cases, transformers must be emptied of oil to reduce weight before moving, and the portable tanks could be used to convert ordinary trucks into oil tankers for short hauls of this nature.



Collapsible tanks offer no cleanliness problem, because filters are easily fitted at the hose connections. Tanks can be inflated with air and cleaned from the inside in the usual manner. Entry is made through a "manhole" in the top of the tank. A special lining eliminates the destructive action of oil on rubber.

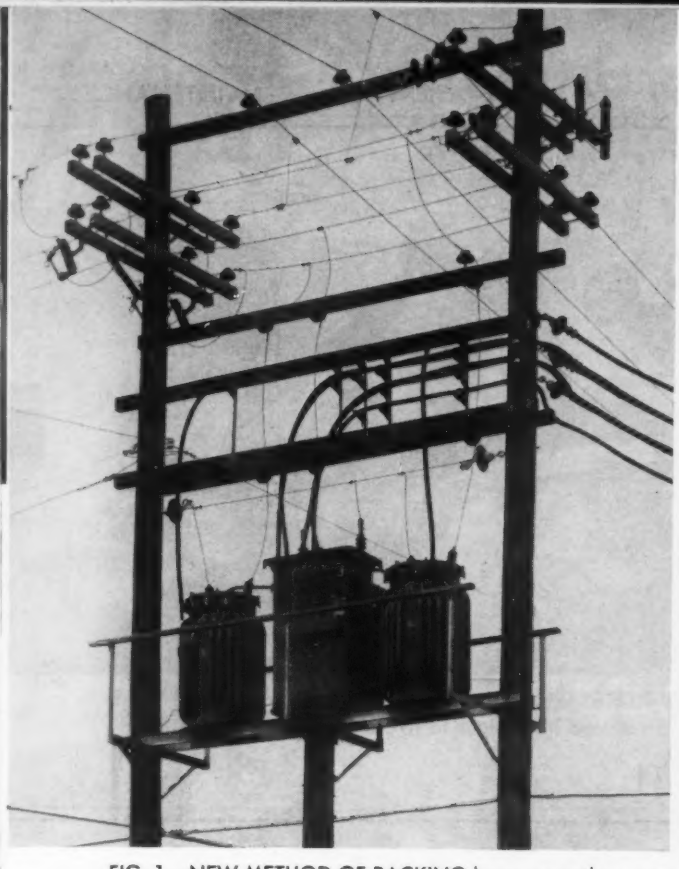


FIG. 1—NEW METHOD OF RACKING large secondary conductors minimizes connections. Savings are $250 to $550 per installation, depending on number of parallel conductors

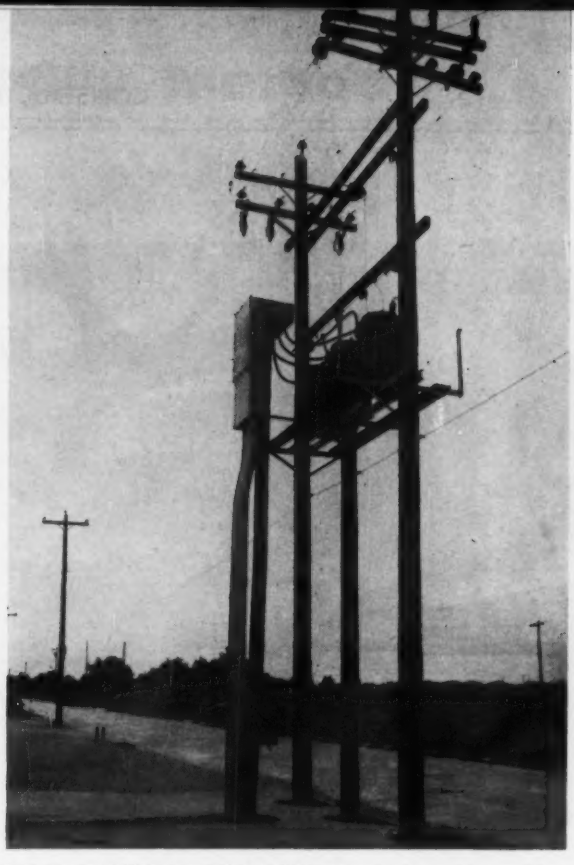


FIG. 2—RACKED SECONDARY BUS is eliminated by making connections directly to customer's service connection. Method is also used for ground-type installations

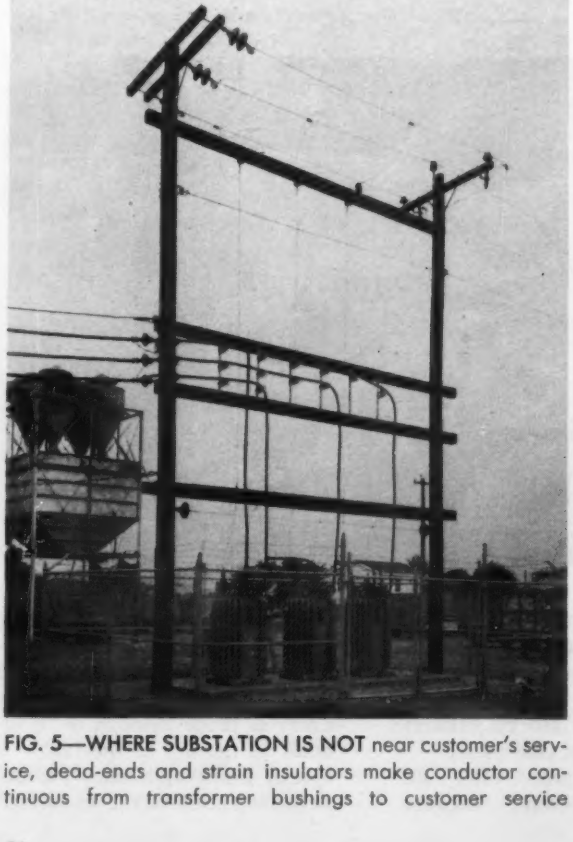


FIG. 5—WHERE SUBSTATION IS NOT near customer's service, dead-ends and strain insulators make conductor continuous from transformer bushings to customer service

Improved Methods

W. W. TRIMMIER, Distribution Engineer, Houston Lighting & Power Co, Houston, Tex.

Significant improvements in substations serving industrial customers have been made by Houston Lighting & Power Co in recent years. In many cases, the improved designs cost less to build than those used earlier.

An improved method of racking large secondary conductors, Fig. 1, has reduced the number of large and expensive connections needed on 3-pole racks to the vanishing point. The new design saves from $250 to $550 per installation, depending on the number of parallel conductor secondary leads and secondaries.

In some instances, the racked secondary bus has been eliminated by making connections directly from the transformer bushings to the customer's service connection, as shown in Fig. 2. Similar connections can be used on ground-type installations.

When load growth is expected, provisions may be made for paralleling the original secondary conductor with a second, 1,000-Mcm conductor per phase. Rack space is provided when the initial installation is made, as shown in Fig. 3. As many as four 1,000-Mcm conductors have been paralleled for each phase, Fig. 4.

Service continuity can be improved and maintenance

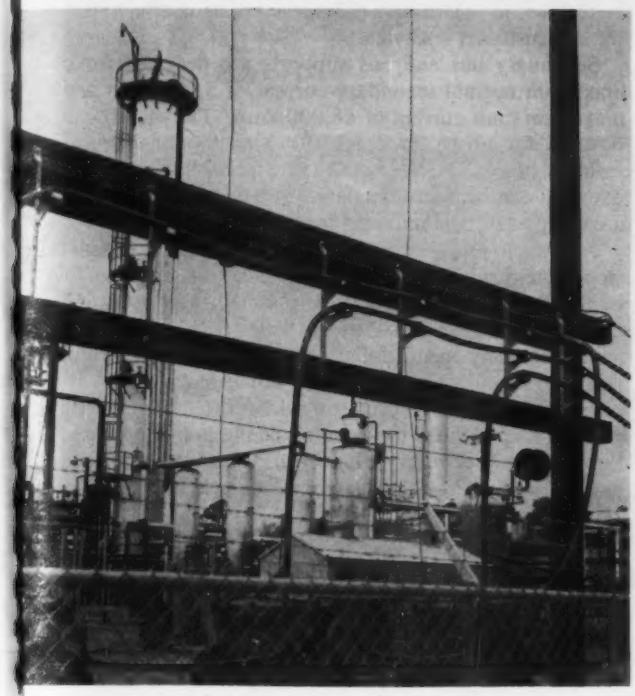


FIG. 3—**LOAD GROWTH IS ANTICIPATED** by providing rack space for parallel conductors in initial installation. Rack has room for second 1,000 Mcm cable per phase

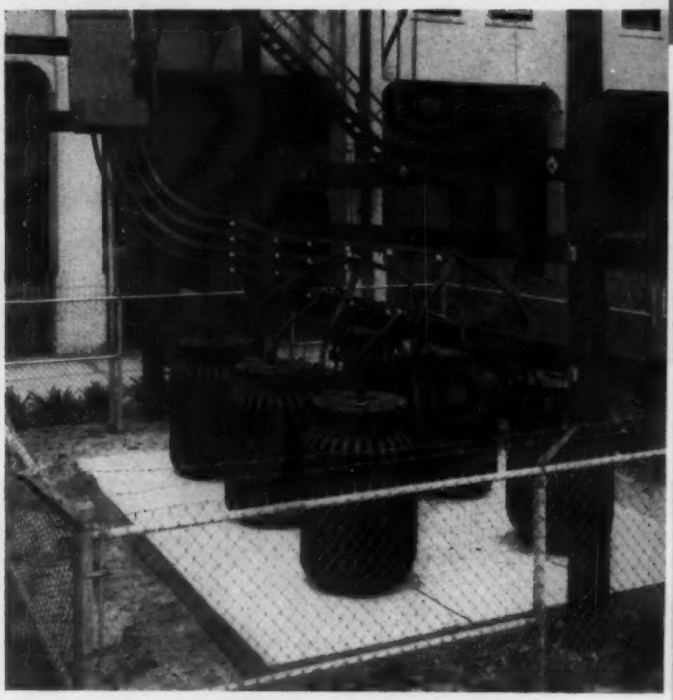


FIG. 4—**AS MANY AS FOUR** 1,000-Mcm secondary conductors for each phase have been paralleled in some installations. Additional conductors are added as load grows

Cut Industrial Substation Costs

reduced by minimizing the number of current carrying clamps. When substations can not be located adjacent to the customer's service, dead-end clamps and strain insulators are used to make the conductor continuous from the transformer bushings to the customer's service.

A special rack has been developed by Houston Lighting & Power to simplify the tying down of secondaries. With the previous method—mounting secondaries on underground racks, steps, and saddle insulators—it was difficult to tie down the conductors. With the special spool-step rack, Fig. 6, the conductor is supported by the spool and tied in place with No. 6 copper tie wire. This has proved to be a marked improvement over the previous method.

When the feed to the substation is underground, simple steel members are sometimes used, as shown in Fig. 7, to support primary cables on one side and secondaries on the other side. This substation accommodates loads up to 1,500 kva, with three 500-kva transformers in an area 16x26 ft. It may be completely concealed by an 8-ft wall.

A new substation design, Fig. 9, has been developed for loads above 1,500 kva and utilization voltages between 460 and 4,160 v. Primary voltage is 12.47 kv. Separate primary and secondary structures are used.

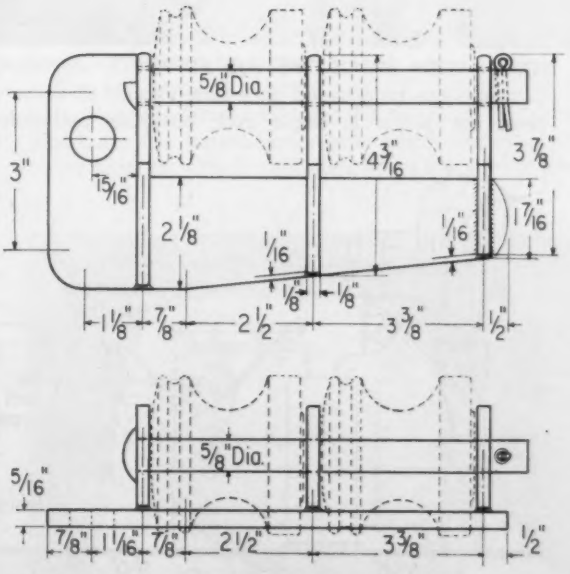


FIG. 6—**SPECIAL SPOOL-STEP** type rack simplifies job of securing conductors. Supported by secondary spool, conductors are tied in place with No. 6 copper tie wire

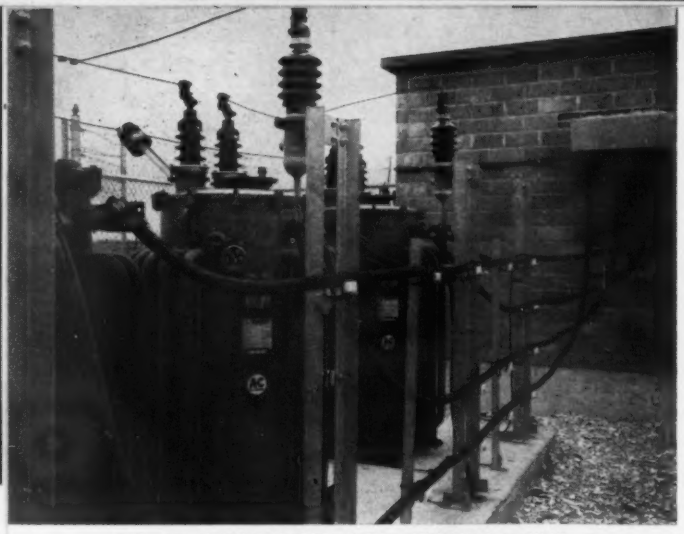


FIG. 7—SUBSTATION WITH UNDERGROUND feed uses simple steel members to support primary cables and pot-heads on one side, and secondaries on other

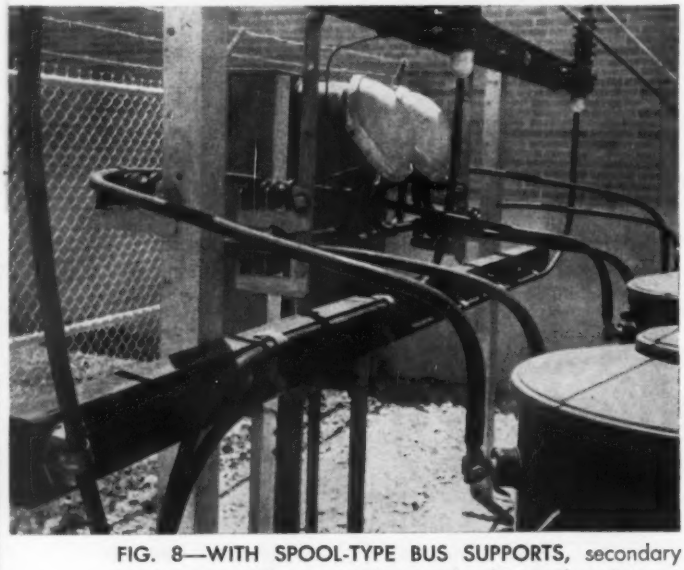


FIG. 8—WITH SPOOL-TYPE BUS SUPPORTS, secondary conductors can be grouped more closely together. Primary cables are pulled in single duct, obviating pull hole

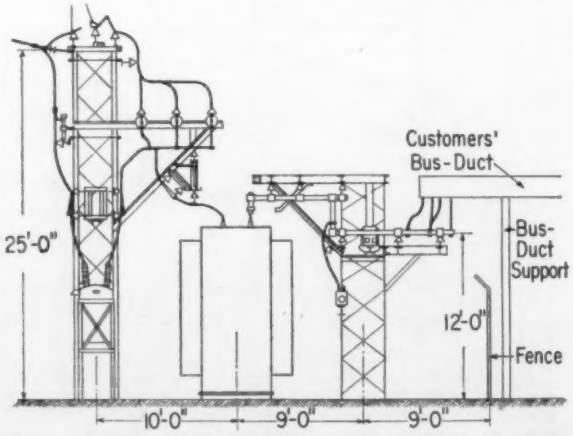


FIG. 9—SUBSTATION DESIGNED FOR LOADS of 1,500 kva or more has separate primary and secondary structures. Primary is 12.47 kv; utilization voltages, from 460 to 4,160 v

The primary structure will accept standard line drop-out cutouts, power fuses, or oil circuit breakers. Secondary structures support the secondary bus and metering equipment and provide a point of attachment for the customer's service.

Secondary bus and bus supports are designed for a maximum normal secondary current of 5,000 amp and maximum fault current of 68,000 amp. The design can be used for up to three 1,250-kva single-phase transformers or one 3,750/5,000-kva 3-phase unit. A second bay can be accommodated if necessary. A fenced area of 35x40 ft is required for two bays.

Industrial substations are served from the transmission system when required by the size of the load or by unusual load characteristics. Transformer protection costs for this type of substation have been reduced, in some cases, by using differential and time-overcurrent relays to trip a grounding switch which faults the transmission line. This causes the oil breakers on the line to open and initiates the opening of the motor-operated line switch, after the line has been de-energized. When system conditions make the grounding switch unsuitable, breakers are installed.

Reclosers have proved to be an economical way of providing the alternate supply required by some loads. They provide overcurrent protection for the substation and automatic transfer from one circuit to another.

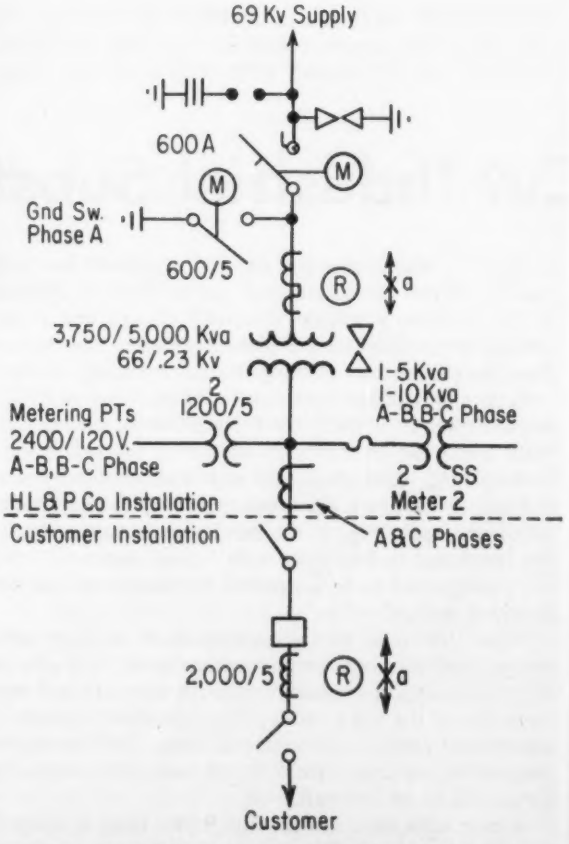
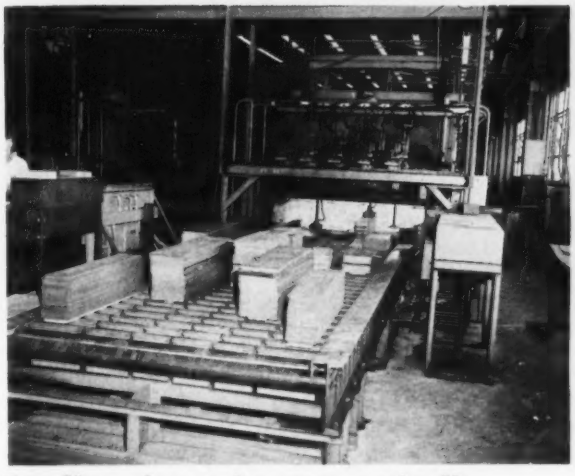
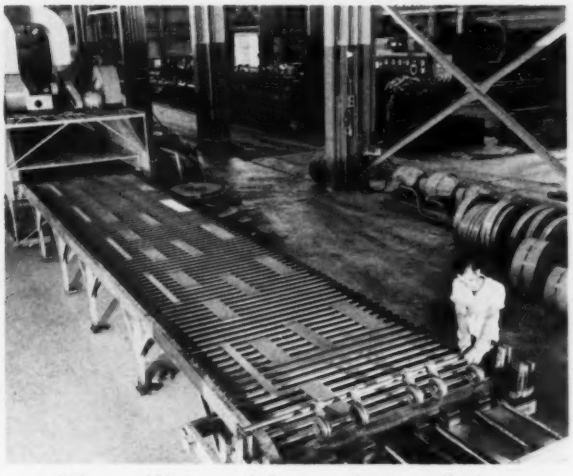


FIG. 10—PROTECTION COSTS FOR SUBS fed from transmission lines are reduced by using differential and OC relays to trip grounding switch which faults transmission line



Feeding sheets in automatically...



and handling wide variety of sizes...

Continuous Annealing Proves Flexible, Efficient

Substitution of continuous annealing for a batch-type operation in stress relieving silicon steel laminations for power transformers has produced significant production advantages in General Electric Co plants in Pittsfield, Mass and Rome, Ga. Among the benefits of the new system:

1. It permits shorter, more flexible production cycles
2. Energy per pound of product is low – 260 kwhr per ton
3. No special atmosphere is required
4. Labor required for handling the laminations is low

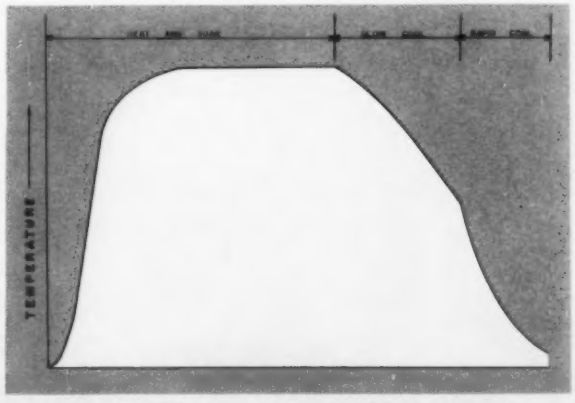
Used to eliminate stresses introduced in the shearing, slitting, and heat flattening processes, the furnaces are designed to operate at 800 C, but can be used at temperatures up to 900 C. Furnace ratings vary between 653 kw and 1077 kw, depending on furnace size.

Individual laminations are fed into the furnace automatically from stacks placed on the loading platform. Laminations are carried through the furnace on a roller hearth, cooled under controlled conditions, and discharged onto a run-out table. Laminations which require application of insulating enamel are run directly from the furnace through the enamelling equipment with no intermediate handling.

The speed at which the laminations pass through the furnace can be adjusted with a variable speed drive. Several different lengths and widths of laminations can be processed at the same time in normal operation. This, coupled with the short cycle time, allows freedom of operation in scheduling as production dictates. Since the full area of each lamination is exposed to the same heating and cooling conditions, each lamination is annealed with the same degree of unformity.

The type of short heating cycle eliminates carbon pickup by the silicon steel and permits the use of an air atmosphere, with an accompanying saving in operating costs. Moreover, with the continuous annealing, the phosphate coating used to insulate the laminations adheres firmly, with no sign of scaling.

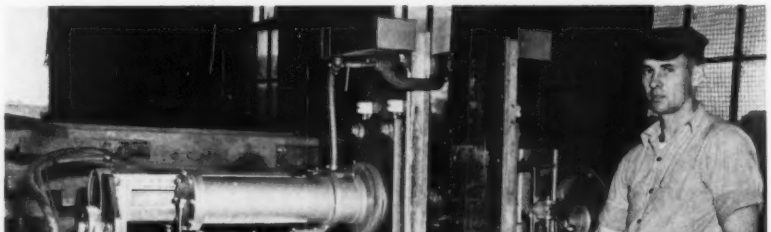
The end result is a better product. Laminations are flat and low in stress, reducing the weight of the assembled core. The finished units have better efficiency, due to the superior surface insulation, and a lower noise level.



FAST HEAT-UP minimizes processing time without creating distortion. Heating, soak, and cooling zones are each adjustable.

Electric Shell Core Moulding Improves Product

R. L. SPENCER, Power Sales Engineer, Consumer Power Company, Jackson, Michigan



ELECTRIC SHELL core moulding machine has increased production, improved product quality, cut production costs, and improved foundry's competitive position.

Electric shell core moulding used by the Calhoun Foundry Co of Homer, Michigan, has increased production, improved the product, reduced production costs and requires less floor space. The electric machine was purchased recently by Calhoun and they feel that it has greatly improved their competitive position.

The old method of core making required two or more men to shape the cores, handle sand and dryers, and load and unload the ovens. With the electric core machine one man can start and complete the entire operation, and do so without a long delay for "heat-up" time.

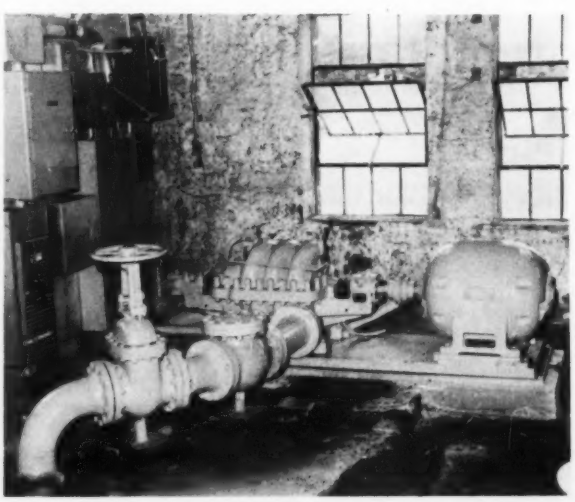
The electric machine fills the box of cores in about two seconds and cures them in 20 seconds, compared with one minute to hand-fill the core box and two hours of oven curing time previously required. This means greater speed and versatility in filling orders. Also, cores made electrically are better in quality, losses due to imperfections and breakage are reduced, and production capability is greatly increased.

The electric shell core machine requires no dryers which cost $5.00 to $14.00 each. Although this saving is partially offset by the higher cost of better core boxes, the problem of storing and handling dryers is eliminated.

The new method of core making requires a special resin sand which costs about $55 per ton more than regular sand. However, Calhoun plans to reduce this difference considerably by mixing their own sand.

With all these advantages this machine requires only 20kw of power, and costs only $1.99 per continuous hour of operation based on Calhoun's average power cost of 2.36¢/kwhr.

Electric Pump Proves Superiority Over Diesel



J. L. MUMMA, Industrial Sales Representative, Pennsylvania Power & Light Co, Harrisburg, Pa

"It's quiet, requires little maintenance, compact, rugged, and above all, economical." That's how the Hummelstown Water Supply Co engineer sums up his satisfaction with a new 200-hp electric water pump. Located near Harrisburg, Pa, the company operates a wholesale and retail water service. The new pump is scheduled for a base load operation 21 to 23 hr per day, and will retire an indentical pump, driven by a twin diesel, to stand-by service. The 200-hp induction motor drives a centrifugal pump at 1,750 rpm. Pump performance is 1,420 gal per min with a 485-ft head. The switch from diesel to electric power was made after a detailed comparison of the two systems.

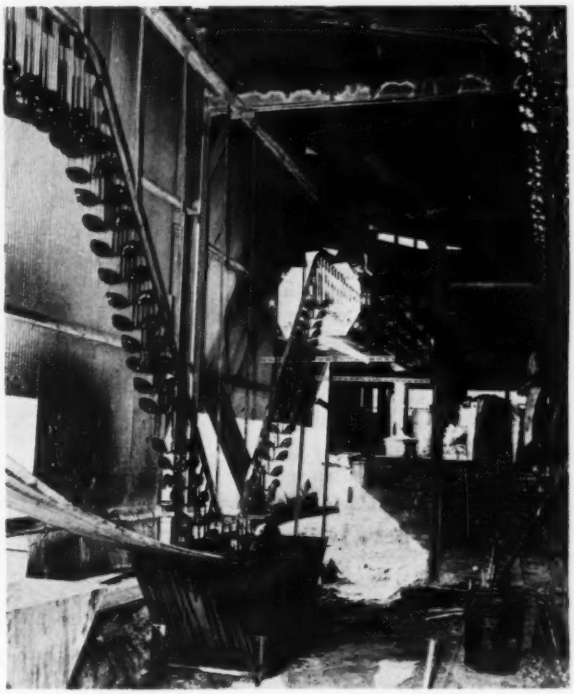
Lower Costs Stem From Switch To Electric Power

HOMER H. TURNER, Industrial Power Engineer, Alabama Power Co, Birmingham, Ala

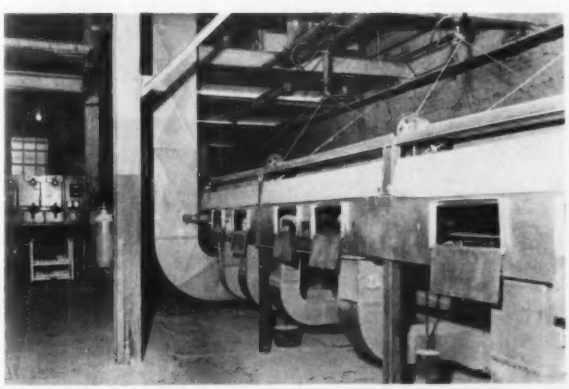
Lower operating costs, improved efficiency, safer working conditions—these are some of the benefits of a new electric conveyor oven used to dry metal castings at the Cosper Manufacturing Co, Inc in Birmingham, Ala. Using 96 heat lamps, each rated 375 watts, the oven replaces a system using two old-fashioned, kerosene burning salamanders. Another advantage is that drying time is reduced, permitting the use of a thicker, better grade of paint on the castings.

An electric conveyor carries the castings through the oven and then through a vat of protective paint. Then they are brought back to the starting point, removed from the conveyor, and packed for shipment.

Before the oven was installed, castings were dipped while cold into the paint mixture and then dried by the salamanders. Each of the salamanders cost about $25 and seldom lasted over two or three weeks before being destroyed by its own excessive heat. In addition to the high replacement and operating costs, the salamanders presented a hazard around the volatile paint mixture.



Modern Oven Is Key To New Line of Products



GEORGE C. WINNER, Sales Promotion Dept, Philadelphia Electric Co

A modern electric oven is responsible for an entirely new line of products at the Aldan Rubber Co, Philadelphia, Pa. Previously limited to production of rubber coated products, they can now process high quality vinyl coated fabrics and expand their line of sheeting, furniture covering, and other products to new markets.

The 120-kw oven is safe and provides accurate temperature control for curing and drying the plastic fabrics. Rolls of newly coated materials up to 6 ft wide are fed through the 37-ft oven which contains 10 heating panels and 18 resistance heaters.

What's Your Production Problem?

If you have problems in lighting, drying, casting, forging, painting, or materials handling, consult your local power company. Let their experienced specialists show you how to cut costs with electric power.

Ultra-sonic Cleaners Assure Quality Product

RALPH O. SMITH, Industrial Sales Engineer, Connecticut Light & Power Co, Willimatic, Conn

Absolute cleanliness of their precision electronic relays is assured by modern ultra-sonic cleaning at the Plantsville, Conn facilities of the Allied Control Co. Used in highly critical gear, these relays must be highly reliable and completely free of dirt, dust, or any foreign particle that might cause a failure in operation.

To guarantee this cleanliness, each relay is thoroughly flushed out in the ultra-sonic cleaners before it is enclosed in a hermetic container. All parts of the assembled relay are within easy reach of the ultra-sonic vibrations. The equipment is compact and easy to operate. In addition to speeding up the cleaning as much as 10 to 100 times, it enables Allied to clean many items that could not be handled any other way.

A total of four cleaners, rated 250-w each are used.

COMPACT AND EASY TO OPERATE, four 250-watt ultra-sonic cleaners scour foreign particles from precision electronic relays. Job is done faster and better.

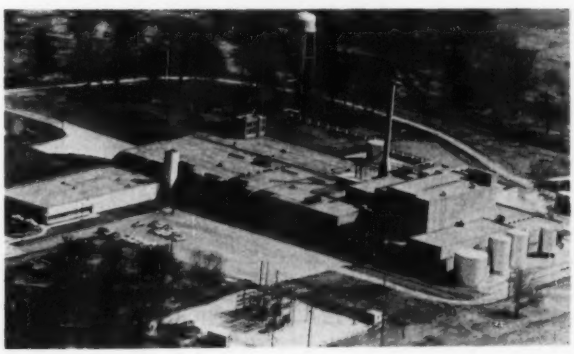
Electric Heat Plays Big Role In Unique Process

MARVIN D. HENDERSON, Industrial Sales Engineer, Illinois Power Co, Decatur, Ill

Making skins for skinless hot dogs sounds like an unusual business. It is—and it's a complicated, exacting process to make skins for each of the 10 billion "franks" America consumes each year. And electric heat and air conditioning play a vital part in the process at the Dansville, Ill plant of Tee-Pak, Inc, who make thousands of miles of cellulose casings—the "skins"—each year.

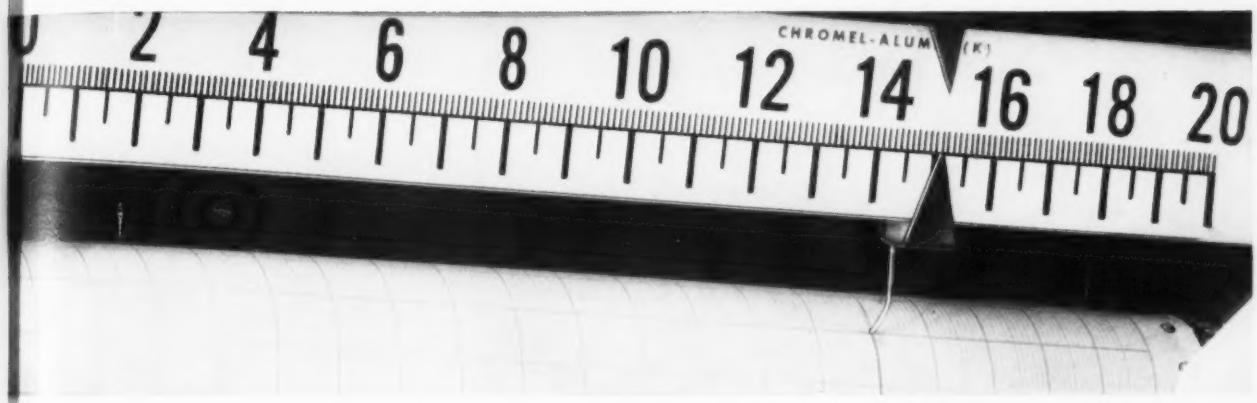
While they're being processed, skinless hot dogs really do have transparent cellulose skins. Later, after the meat is cooked and smoked, the casing is stripped off by automatic machines in the meat packing plant.

To make the cellulose, huge cauldrons holding a brew of chemicals and cotton linters must be kept heated at a constant temperature. Naturally, electric heat is a perfect solution. Tee-Pak uses approximately 100-kw of strip heaters to do the job. And, to "keep the cake from falling," the plant must be well air conditioned. Total air conditioning installation at the Dansville plant is 1,000 hp.



To insure the vital process against power interruptions, Tee-Pak is served from two separate 69-kv lines, coming from different utility substations. Distribution within the plant is at 4,160 v.

standardizes itself continuously . . .

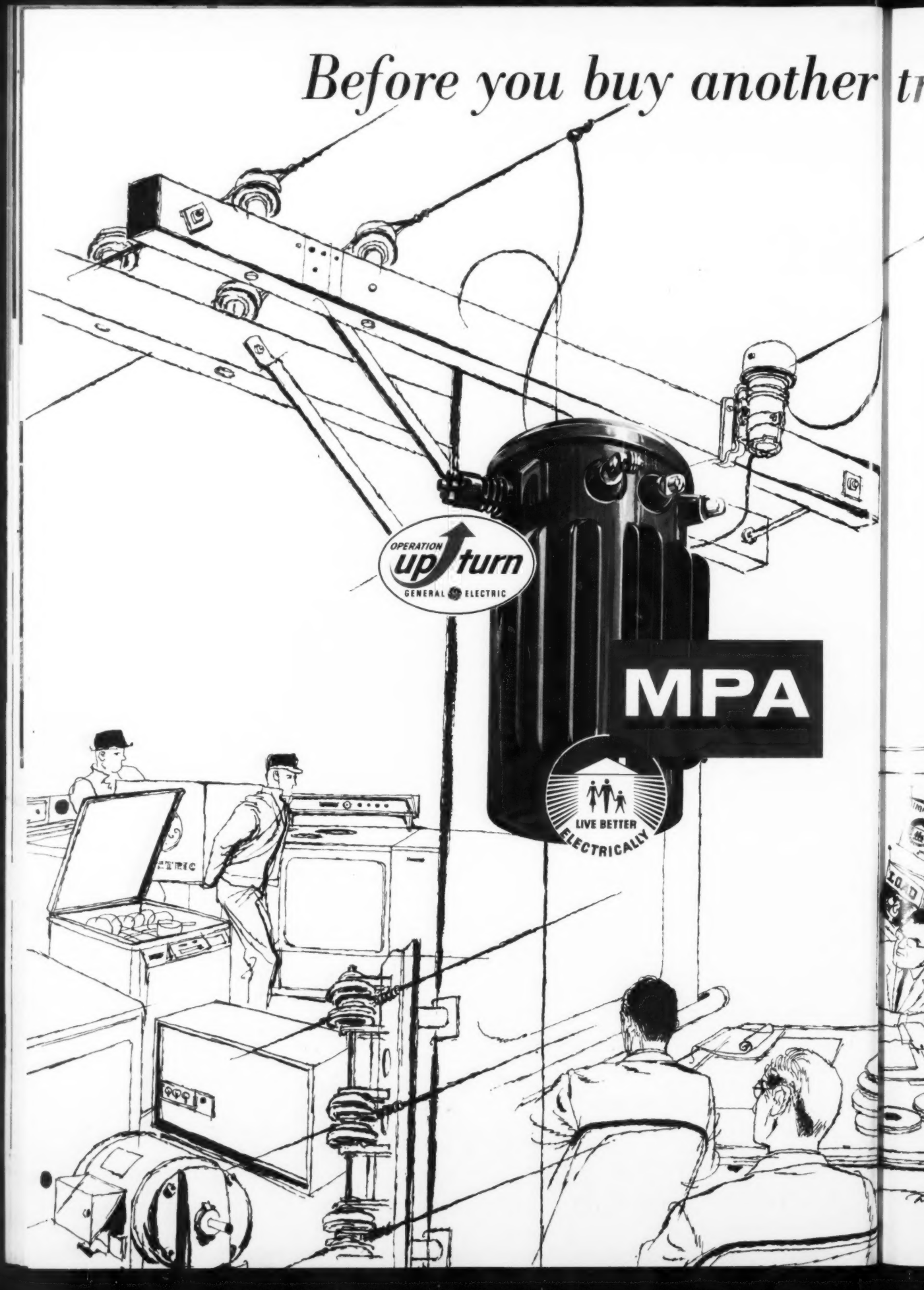


This new General Electric Type HF recorder is continuously self-standardized. And it's typical of the new G-E null-balance strip-chart line. No more batteries, standard cells and standardizing mechanisms . . . new silicon diode voltage source now makes possible completely uninterrupted measurement and control—with measurement accuracy of ± ¼ percent. ***Unitized plug-in construction*** provides simple design with isolation of components by function. All major components are mounted on swing-out mechanism panel for easy servicing outside case. Both single-pen Type HF and two-pen Type HL are available. Or, for an intermittent record of up to 20 different signals, G.E.'s new Type HG multi-point recorder prints as fast as 1.2 seconds per point. All types measure ***wide range of parameters . . .*** pen speeds from 1 to 24 seconds, chart speeds from 1″/hr to 360″/hr, plus many other optional accessories and a variety of control forms. Get the complete story about these and many other outstanding features. Just call your nearby G-E Apparatus Sales Engineer, or write for bulletin GEA-6887, Section 595-102, General Electric Company, Schenectady, N. Y.

Other Instrument Department Recorders for Electric Utilities— *Inking and inkless; portable and switchboard; duplex and twin; hook-on recording volt-ammeters. Photoelectrics, oscillographs and vibrometers.*

Progress Is Our Most Important Product

GENERAL ELECTRIC


Before you buy another tr
OPERATION
up turn
GENERAL ELECTRIC
MPA
LIVE BETTER
ELECTRICALLY

transformer... MEASURE LOAD BUILDING

General Electric programs and products put load on your line

For every distribution transformer you purchase from General Electric, almost a dollar is invested in More Power to America, Live Better Electrically, Operation Upturn, and in other industry-wide load-building and adequate-wiring programs.

General Electric sells two dollars' worth of equipment to *consume* electric power for every dollar's worth sold to *produce* electric power. And you get the load built by these power-consuming products, ranging from home appliances to giant furnaces for industry. So General Electric products as well as programs build load.

Before you buy another distribution transformer, measure load-building activity—give your transformer manufacturer credit for the extra values he gives you. General Electric Company, Schenectady 5, New York.

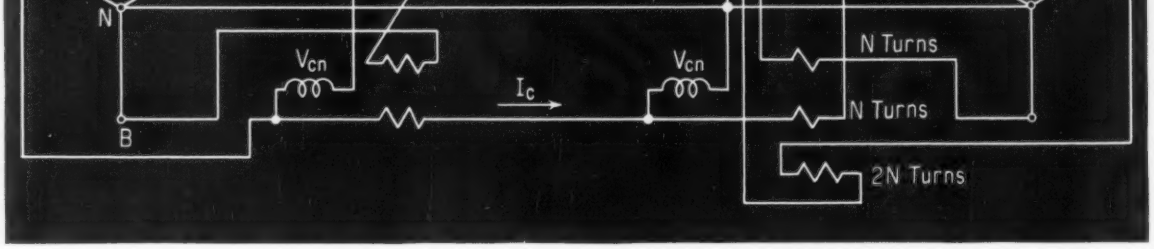
431-78

Progress Is Our Most Important Product

GENERAL ELECTRIC

GIVE YOUR TRANSFORMER MANUFACTURER CREDIT FOR THE EXTRA VALUES HE GIVES YOU		G.E.	OTHER MFGRS.			
MEASURE LOAD BUILDING—do Co.'s other products build load? Does Co. sponsor load-building programs?						
CHECK SERVICE—24-hour shipment? repair and uprating? emergency assistance?						
COMPARE FEATURES—how many exclusive features in terms of longer life; reliability; easy maintenance?						
ANALYZE PRICE—does Co. hold line against inflation with significant product developments?						
EVALUATE INNOVATIONS—has Co.'s research paid off for you? Recent examples?						

FILL IN THE BLANKS . . . See which manufacturer gives you more for your transformer dollar: Mark "X" for a measurable contribution, "O" for insignificant contribution.



VARHOUR METERS do not require external reactiformers or other means of shifitng the phase of the supply voltage. Incorporating these meters in reactive metering installations reduces the size of the enclosure needed to house equipment

Polyphase Varhour Meter Saves Space

DALE F. BECKER, Engineering Department, Sangamo Electric Co, Springfield, Ill.

Increasing interest in the measurement of reactive volt-ampere hours for billing purposes has prompted the development of simple varhour meters for use on 3 and 4-wire polyphase circuits. The meters are completely self-contained and do not require external reactiformers or other means of shifting the phase of the supply voltage.

This self-contained feature substantially reduces total cost of a reactive metering installation, as well as the size of the enclosure needed to house the metering equipment.

Key to the new 3-phase 4-wire-Y varhour meter is the utilization of special interconnected current coils to provide a composite current flux. This current flux is of such a phase and magnitude as to permit use of the standard watthour meter voltages. As shown by the schematic diagram, the varhour meter is provided with two N-turn current coils, and one 2N-turn current coil.

Coils on the stator with the A-phase voltage coil are connected to produce torque P_1 where:

$$P_1 = V_{an} \cdot [2\,I_c - I_a - I_b]$$

Coils on the stator with the C-phase voltage coil are connected to produce torque P_2 where:

$$P_2 = V_{cn} \cdot [I_b + I_c - 2\,I_a]$$

Combining P_1 and P_2 on the common shaft gives a resultant meter torque:

$$P = V_{an} \cdot [2\,I_c - I_a - I_b] + V_{cn} \cdot [I_b + I_c - 2\,I_a]$$

It can be shown that this torque is proportional to total polyphase vars. Actually it is equal to $\sqrt{3}$ times the value of total polyphase vars.

The factor of $\sqrt{3}$ can be eliminated by the proper choice of disk speed and disk constant. The new meter will run forward when connected to a lagging power factor load with an ABC phase sequence. The only assumption made is that of balanced voltages.

Varhour meters are available in either socket or bottom-connected versions. The external connections are exactly the same as the corresponding watthour meter connections. This virtually eliminates the possibility of wiring errors. With adequate instrument transformers, both watthour and varhour meters can be connected in transformer secondaries and have their respective sockets or terminal blocks wired identically.

It is possible to test the meter with standard test equipment. To test either the 4-wire-Y or 3-wire 3-phase meters, it is only necessary to connect current coils in lines A and C in series and test the meter in the same way as a standard two element meter.

Will Link Indian Point with System

Consolidated Edison Co's 230-kv four-circuit, steel-tower transmission line will be the only outlet to system from nuclear plant now going up

The only electrical outlet from the nuclear power station at Indian Point to the Consolidated Edison Co system will be a 230-kv four-circuit overhead transmission line to the substation at Millwood in Westchester County. From Millwood, the power generated at the nuclear station will be fed into the company's system.

Negotiations have been completed for the purchase of a 400-ft right-of-way between Millwood and Indian Point. Specification and design work has been completed, and construction of the line is expected to begin in 1959.

The new transmission line is scheduled to operate in April, 1960.

More Circuits Planned

For such a line, substantial transmission capacity will be required immediately upon its completion as well as later. Two overhead circuits will be needed at first, and two more are expected to be needed in the future.

Company studies indicate that the most economical construction would consist of tower structures built for carrying four circuits ultimately rated at 230 kv.

Initially, however, these two circuits will be installed for operation at the 138-kv level.

Four Circuits Foreseen

Although use of a four-circuit tower allows for a slightly narrower right-of-way, this was not the decisive factor in preferring a four-circuit line to two two-circuit lines. The four-circuit line will cost more initially. Yet, it would be more expensive, were a two-circuit line built now, and a second such line 5 to 15 years hence.

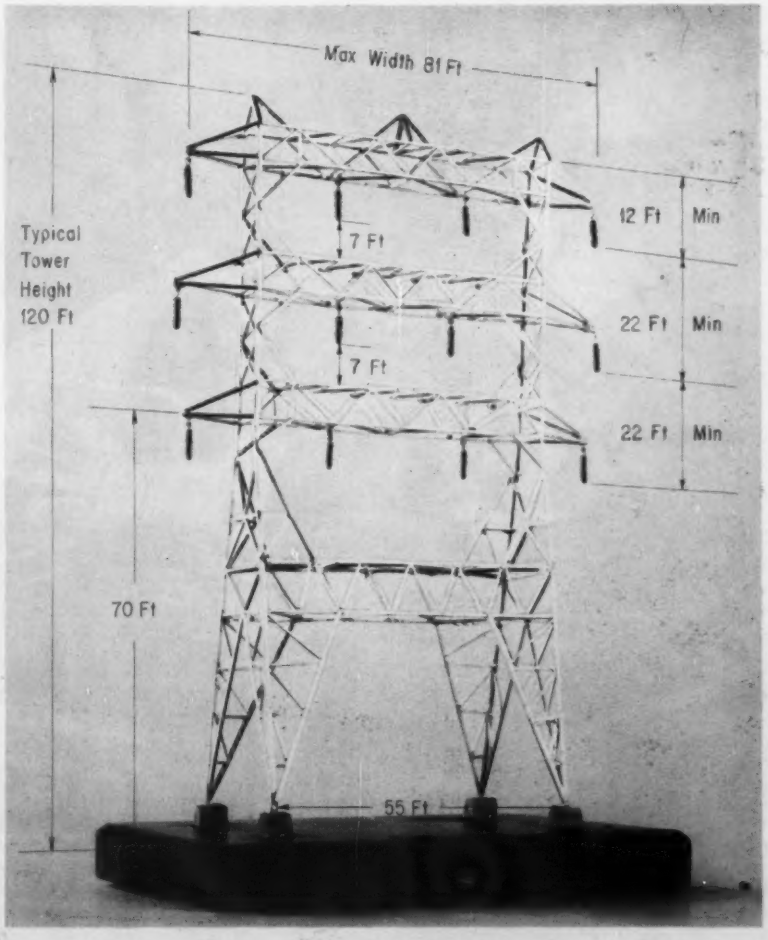
The purchased right-of-way will afford room for the ultimate erection of another set of towers which will be similar in design to the original ones.

In the line's final state, each of the four circuits will have three conductors of 1,590-MCM ACSR. The line, when furnished with all four circuits, will have the capacity for transmitting a larger block of power than any overhead transmission line now in existence. At 230 kv, the line will be rated at 375 Mw per circuit.

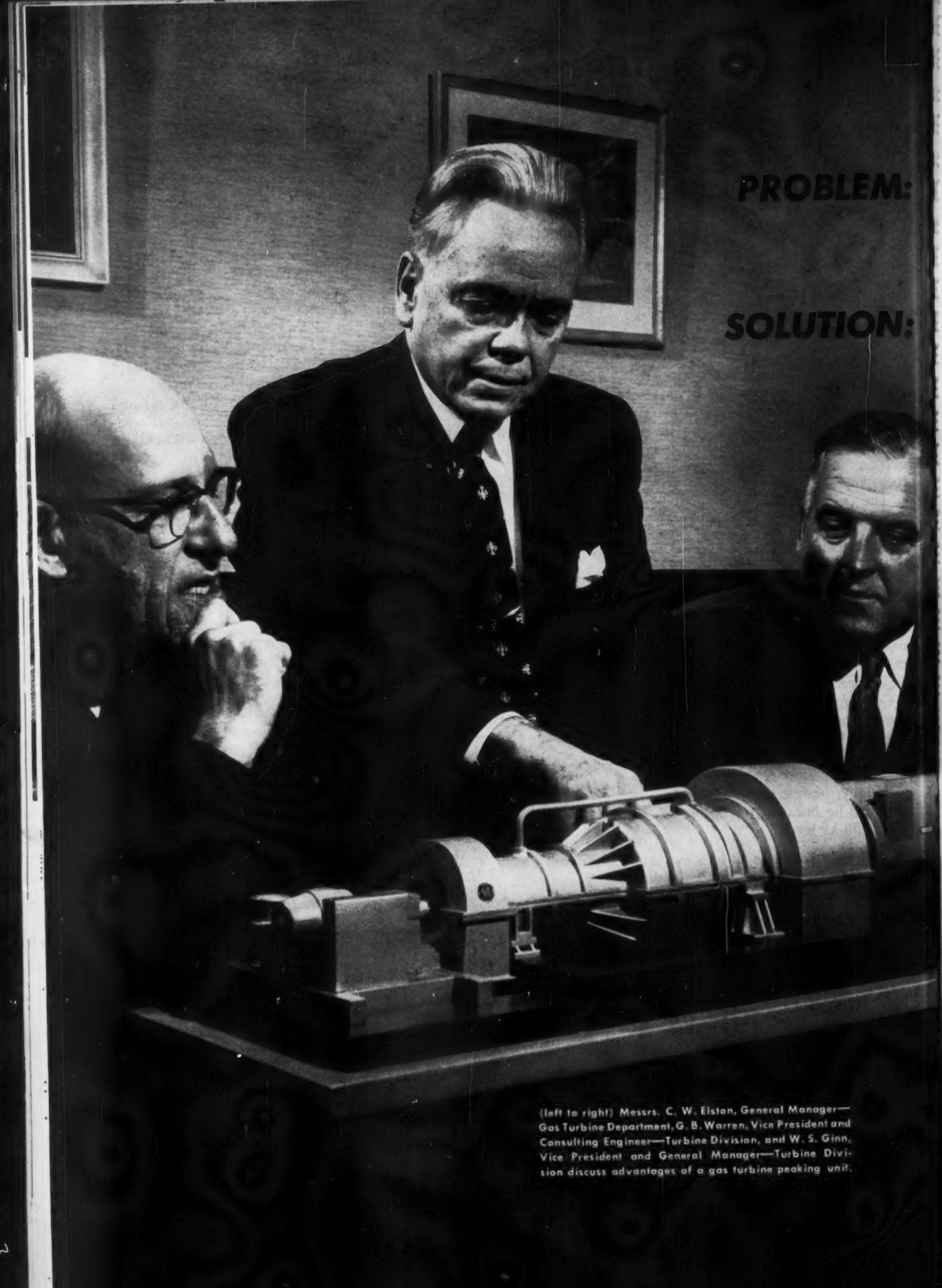
In contrast with the 1,590-MCM ACSR conductors proposed for the new overhead transmission line, the tower line recently completed between Dunwoodie and Millwood has two circuits of 1,033-MCM ACSR conductors.

The towers will be the most heavily loaded support structures designed for such a purpose. Each tower will be grounded solidly, and driven ground rods or a buried counterpoise will bring resistance within the 10-ohm limit wherever required.

Shielding wire will be ½-in. Special EHS Copperweld, and the midspan clearance between the shielding wire and conductor will be at least 7 in. even with the shielding wire loaded with a ½-in. of ice and no ice on the conductor. All insulators and attachments will be radio interference proof.



TYPICAL TOWER will be constructed of galvanized steel angle members and structural members. It will be 120 ft high and 81 ft wide at its greatest width



(left to right) Messrs. C. W. Elston, General Manager—Gas Turbine Department, G. B. Warren, Vice President and Consulting Engineer—Turbine Division, and W. S. Ginn, Vice President and General Manager—Turbine Division discuss advantages of a gas turbine peaking unit.

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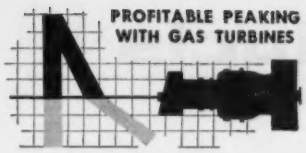


A decade of expanding peaking requirements for electric utilities

Gas turbines—economical answer to varied peaking applications

Rapid peak load growth coupled with reduced steam cycle efficiency gains made in recent years have focused new attention on the costs incurred for providing added peak load capacity.

Today many electric utility systems are relatively saturated with steam turbines nearly as efficient as the latest units. This basic change in the economics of peak load generation dictates a renewed interest in low-investment gas turbines for a wide variety of peaking applications.

Let's examine briefly some of the basic advantages inherent to gas turbine peaking.

GREATER CAPACITY IN ONE UNIT. In sharp contrast to small building-block units, General Electric offers a peaking gas turbine designed to produce 20,000–25,000 kilowatts. Even larger units are planned to keep pace with system load growth. Because one machine can produce over 10 times more kilowatts than a building-block unit, space, installation and maintenance costs and control complexity are appreciably reduced.

LOWER INSTALLED COST—Because of their low cost per kilowatt of capacity, low space requirements, minimum foundations and extreme simplicity, simple-cycle gas turbines are available to play an increasing role in utility peaking plans.

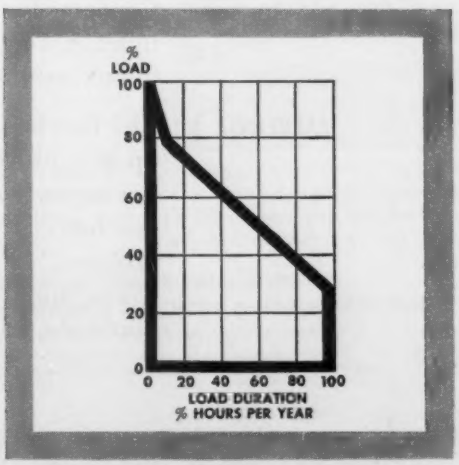
LOWER OPERATING LABOR COST—Due to their extreme simplicity, compact arrangement, and easy-to-use controls and auxiliaries, General Electric gas turbines require a minimum of operating labor. When installed at existing steam power plants, additional operating labor is usually not required. Opportunities of remote operation provide still another means of substantially reducing this type of peak load generating expense.

LOWER STANDBY COST—In sharp contrast to steam plants which must be kept hot during off-the-line periods, gas turbines require no attendance or auxiliary service during periods of inoperation. Since standby fuel costs are eliminated, the total fuel consumption for equivalent peak generation is often less with gas turbines.

LOWER MAINTENANCE COSTS—With maintenance charges for older steam units increasing steadily . . . and with the prospect that maintenance costs will increase still further with the eventual assignment of modern reheat steam units to peaking service, low gas turbine maintenance costs are of growing importance to many utilities. For short duration peak load service, gas turbine maintenance costs will be considerably less than with older steam plants often used for this service.

Gas turbines are ready—now—to fill your growing peaking requirements. With 189 units now in service logging a total of nearly 3,000,000 operating hours, General Electric gas turbines stand ready to assume their rightful role in helping meet tomorrow's growing peaking power demands—economically.

FOR MORE INFORMATION contact your nearest G-E Apparatus Sales Office or write Section 261-33A, General Electric, Schenectady 5, New York.



WITH THE TOP TEN PER CENT of system load having a duration of only a few hundred hours annually, gas turbines offering lower initial investment costs are General Electric's answer to peaking power requirements of the future.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Procurement & Products

PRICES ▶ **Commodity prices aren't likely to "take off,"** says McGraw-Hill's Dept of Economics. History shows rapid rises in the Wholesale Commodity Price Index have had roots only in wartime scarcity since Civil War days. There's also strong evidence that the recent rate of "creeping" inflation may slow down in years ahead. Here's why:

Capacity is adequate in basic extracting and fabricating industry—insuring healthy competition. Productivity is on the rise and research spending seems ample to sustain gains in this area. Farm prices are no longer jacking up Consumer Price Index—thus restraining escalator clause wage hikes. Also important: Inflation is becoming a big political issue—gaining more opposition from voters each year.

ORDERS ▶ **Orders are picking up on turbines and boilers** (see page 74). "Buy-and-store" plan, expounded as sound practice by Combustion Engineering, has already been adopted by three utilities ordering boilers: Connecticut L&P; Kansas City P&L; and Consumers Power.

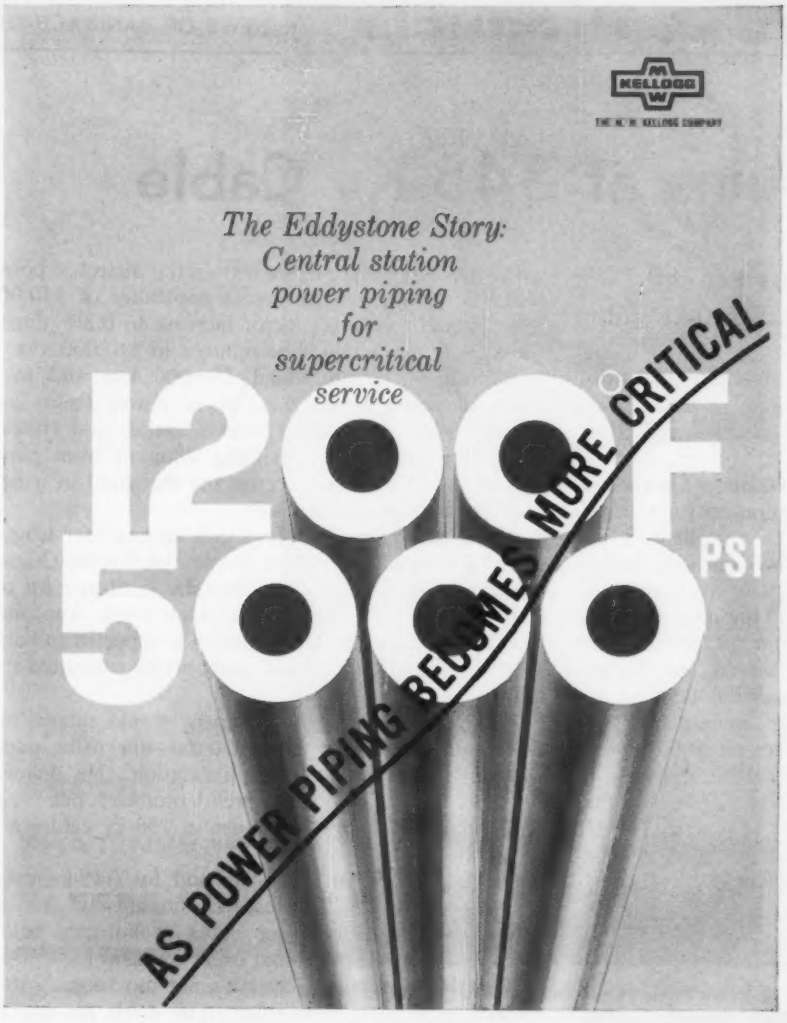
FLEETS ▶ **Space-saving and ease-of-parking** are most interesting aspects of using small compact American-built car in place of standard models, say experienced operators. These advantages even outweigh gasoline economy which might save $30 per car annually.

COMMODITIES ▶ **Industry guesses put steel price hikes at $3 to $10 a ton** in third quarter if and when a strike comes. Average settles at about $4. Producers don't want to raise steel prices, but union rejection of their hold-the-line wage proposal means deadlock and probably a strike—with outlook for a 10¢ an hour hike on 1-year contract. **Copper:** Threat of sale of 128,000 tons of government copper has upset market, but probably won't come off. Producers prices bid to hold at 31½¢.

MEETING ▶ **EEI Purchasing & Stores Meeting May 4-6 in St. Petersburg shapes up** as a provocative session. Under George Cole, Alabama Power Co, topics will include "Value Analysis—how it pertains to utility purchases," "Storeroom Returns—new economic thoughts on an old problem," "Follow-Up—do you keep vendors alert?" Buying-Stores Cooperation," and Evaluating Materials Handling Costs—a hard look points the way to cost reduction."

OTHER FEATURES IN PROCUREMENT & PRODUCTS SECTION

News of the Manufacturers . . . . . **page 72**
Rundown of New Equipment Items . . . . . **page 76**
Reader Service Column for Your Convenience . . . . . **page 80**



M. W. Kellogg's Complete Power Piping Service Keeps Pace

The services performed on one major assignment—the supercritical power piping for Eddystone Station, Unit No. 1—are evidence of The M. W. Kellogg Company's capability to solve the many critical problems encountered with power piping in the modern steam-electric plant.

Kellogg's services for Philadelphia Electric Company during the course of this project have included metallurgical research, flexibility analysis, material specifications, K-welding® and testing during fabrication in Kellogg's Jersey City shop and during field erection.

Some idea of the magnitude and complexity of Kellogg's responsibilities at Eddystone, and how problems were solved, may be obtained from the new 12-page Kellogg booklet, "The Eddystone Story", shown above. Copies will be sent promptly on requests from consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment.

- Metallurgical Research
- Flexibility Analysis
- Material Specifications
- Shop Fabrication
- Field Erection

Kellogg welcomes the opportunity to discuss any or all of its complete power piping facilities with representatives of the industry.

Fabricated Products Sales Division

THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17, N. Y.

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POWER PIPING—THE VITAL LINK

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Anaconda Aims at 345-Kv Cable

New extra-high-voltage research lab will also provide better 138 and 230-kv cable

With its new extra-high-voltage research laboratory, Anaconda Wire & Cable Co expects to develop the higher-voltage and higher-capacity cables needed in the future.

The $1,750,000 laboratory at Hastings-on-Hudson, N. Y., has a variety of precision equipment for research and testing of EHV cable and accessory designs.

At the recent formal opening of the research facility, (EW, Apr. 13, p 92) the company's L. F. Hickernell, vice president-engineering, explained the need for EHV cable and accessories. He pointed out that the difficulty of obtaining right-of-way for additional and higher-voltage overhead lines will increase the demand for EHV cable beyond that presently contemplated. He said cable will be required to "transmit 500,000 kva and over, at 230 kv and above."

Hickernell, who is also president of AIEE, said that conventional designs of pipe-type cable practically have reached their maximum power capability because of inherent losses. For example, 1,500-Mcm 380-kv impregnated-paper pipe-type cable with initial dielectric power factor of 0.22% would have a capability of 340,000 kva. Should the power factor increase to 0.3% during service, the rating would be reduced to 270,000 kva.

To transmit underground 500,000 kva and over, lower dielectric losses (i.e., lower power factor and specific inductive capacity) are essential, said Hickernell. "We must find something different from paper and oil . . . I think we are on the threshold of a new breakthrough in dielectrics."

Anaconda Wire & Cable is now testing four lengths of 345-kv cable at the lab in preparation for the Cornell Cable Test Program. (Coincidentally, contracts for the Cornell tests were signed the same week Anaconda W&C opened its lab. Construction is expected to begin soon, and cable samples will probably be submitted this fall.)

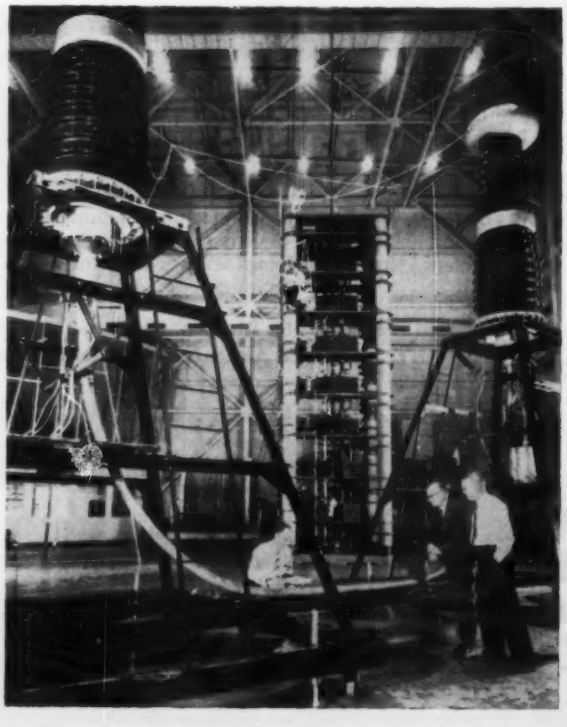
Hickernell said that his company would submit two cable samples for the Cornell tests—one using paper and oil; the other, synthetic insulation. He believes synthetic insulation offers great promise, but strict economics will determine its use in 138-kv cables and below.

Hickernell sees no great demand for 345-kv cable in the near future, but research findings on 345-kv designs will lead to better cable at voltages below 345 kv. Hickernell said that even the need for 230-kv cable is 10 years away, "but it's not too soon to start research now for a new commercial cable for use 10 years hence." He pointed out that heavily populated England today has one-tenth as much underground cable as overhead transmission. As the U. S. population grows, the need for more cable at 230 kv and above can be expected to become greater and more urgent.

But in the more immediate future, an important by-product of this 345-kv research, said Hickernell, is that it will provide improved and more efficient cable at 69 and 138 kv.

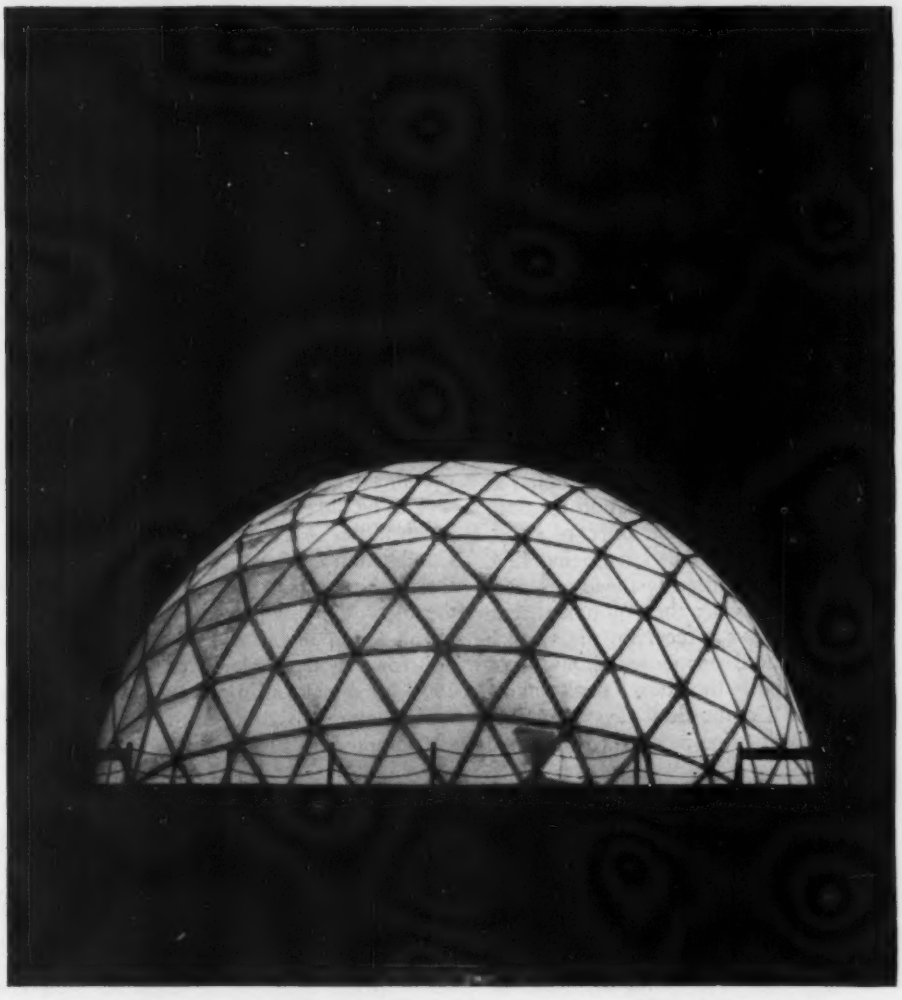
The lab is fully equipped to evaluate EHV cable and accessory designs. In addition to 60-cps ac and impulse voltage testing, facilities are provided to cyclic-load test simultaneously at 150% rated voltage, and operating or higher temperatures, six 150-ft lengths of 2,500-Mcm commercial 345-kv cable complete with joints and terminals.

Electrical apparatus in the lab includes the following: 3,000-kv 150-kw-sec impulse generator; 200-cm sphere gap; 3,000-kv voltage divider; 750-kv cascade transformer set; 2,400-kva tunable reactor; 300-kv 2,400-kva main transformer; 13.2-kv 360-kva voltage regulator; 5,000-amp rectifier; and a 300-kv isolating transformer. Provision is made for future installation of a 1,500-kv dc generator.



(*More Manufacturers News, p* 74)

THE ARCTIC EYE THAT NEVER SLEEPS



This plastic radome houses a radar antenna constantly scanning the skies to detect the presence of aircraft. A line of these radars provides early warning of any threatening approach to the North American continent.

The Distant Early Warning Line is now on perpetual guard duty. Spanning the Arctic from Baffin Island to Alaska, this great system was conceived at the Lincoln Laboratory of M.I.T. and produced under the leadership of Western Electric.

But first the DEW Line had to be engineered into a workable system. This was done at Bell Telephone Laboratories.

The obstacles were formidable. Conventional means of communication—telephone poles, cables and even line-of-sight microwave radio—weren't feasible. A complicated system had to be made to operate reliably in a climate so cold that outdoor maintenance is impracticable farther than a few hundred feet from heated habitation.

Whenever possible, Bell Laboratories engineers utilized well-proven art. But as it became necessary, they innovated. For example, they designed and directed the development of a new and superior radar which automatically scans the skies, pinpoints a plane and alerts the operator.

To reach around the horizon from one radar station to another, they applied on a massive scale a development which they pioneered—transmission by tropospheric scatter. Result: at a DEW Line Station you can dial directly a station more than a thousand miles away and converse as clearly as with your home telephone.

Bell Laboratories' contribution to the DEW Line demonstrates again how telephone science works for the defense of America.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

Turbine, Boiler Orders Mount; 'Buy & Store Plan' Saves $s

Utility turbine and boiler orders pick up, as 1st-quarter bookings indicate utilities will make commitments for about 8 million kw of turbine generators and boilers in 1959.

At the right is a listing of 1st-quarter orders for turbines larger than 10,000 kw. By March 31, U. S. utilities had signed for 1,913,000 kw of turbines and over 2,600,000 of boilers. More than half the kilowatts of turbine capacity were placed with foreign firms.

Utility	No. of Units	Unit Size Kw	Manufacturer
Consolidated Edison	1	340,000	Allis-Chalmers
Black Hills Power & Light	1	22,000	Allis-Chalmers
New England Electric	1	200,000	General Electric
Public Service (N. J.)	1	325,000	Westinghouse
Kansas City B. P. U.	1	60,000	Westinghouse
Los Angeles Dept of W&P	2	200,000	Brown Boveri
Medina Electric Co-op	3	22,000	Brown Boveri
Tennessee Valley Authority	1	500,000	Parsons

Improvement in boiler orders received by manufacturers is noted as partly due to participation by utilities in the buy-and-store plan advanced by Combustion Engineering. Utilities, by ordering ahead of schedule and storing the equipment, can avoid delays in receiving units which they would encounter should they wait until the next peak-buying cycle. Combustion says they can also beat price increases in finished steel, rising shop labor costs, and get ahead of the inflationary trend which would escalate investments much more. A case study made by Combustion Engineering shows that there is a net saving, in following the buy-and-store plan, of $57,000 on an initial investment of $1 million for a boiler ordered in March 1959 for operation in mid-1962.

Advantages to utilities of the plan are summed up by CE as: 1) Utilities can realize a net saving in total cost of from 5 to 10%; 2) Flexibility in starting erection is provided; 3) Start-up date is flexible; 4) Engineering and fabrication are placed in a lightly-loaded period; 5) Elimination of additional costs incurred when delivery can't be made as required; and 6) Ultimate reduction in first costs of future units, due to leveling off of manufacturers' peaks and valleys.

Westinghouse Builds 5-Kw Thermoelectric Generating Plant

The first step toward development of a large-scale thermoelectric power plant is being taken by Westinghouse. The company was recently awarded a Navy contract to "design, construct, test and furnish a 5-kw thermoelectric generator."

The generator, which will convert the heat of a burning fuel directly into electricity, will have a power output larger than that of any generator of this type known to have been constructed.

Construction of the generator, Westinghouse officials said, is the first step in solving the material selection, fabrication, assembly, and operating and control problems of a large-scale thermo power plant.

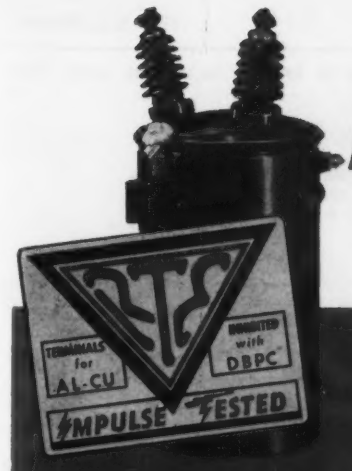
The heat source to power the new thermoelectric generator will be a fuel readily available to the Navy, probably diesel oil or other Navy fuel oil.

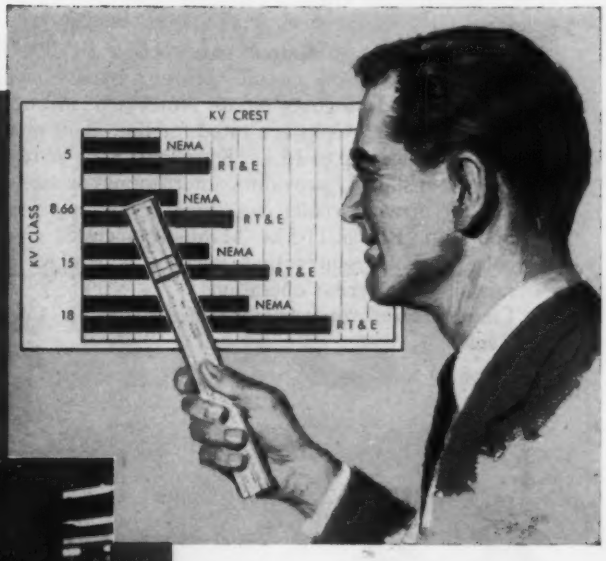
The electrical output of the new generator will be such that it will operate existing Navy electrical equipment. The generator will operate with maximum quietness and will be designed for maximum shock and vibration resistance. Although intended to be the small-scale prototype of a shipboard installation, it may be used directly as a movable or portable power source.

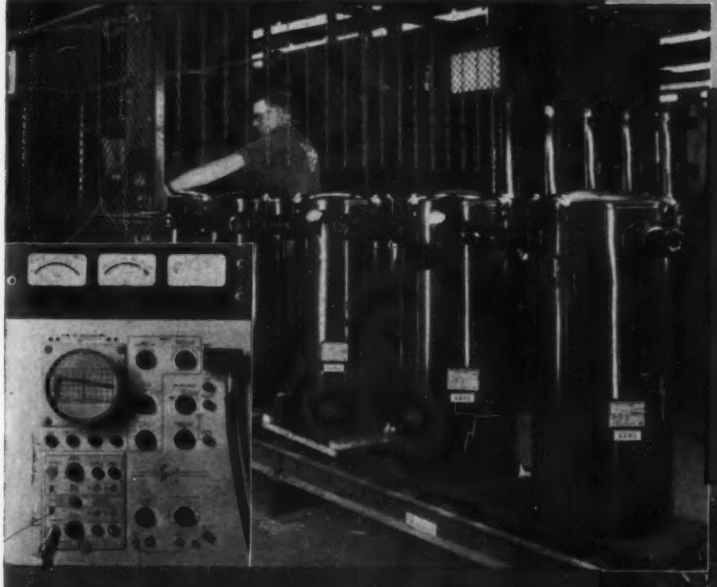
MANUFACTURERS BRIEFS

General Electric's large silicon power rectifier installation is nearing completion at Hooker Chemical's Niagara Falls plant. Three of the four 96-tray units, each providing 12,000 amp at 360 v dc and operating from imput voltage of 13.8 kv, 60 cyc, have been energized. The rectifiers, replacing 12 rotary converters, will deliver 17,280 kw of dc power to operate Hooker's electrolytic cells. GE believes it is the nation's largest installation of this type . . . **Westinghouse** has built a 600-kva power center of special low-height design and installed it in an eastern U. S. coal mine. The company claims it is the highest-rated sealed dry-type unit on record to be used for this purpose. A delta-connected primary and a wye-connected secondary are used to reduce 7200 v to 480 v. The dry-type core-and-coil assembly is totally enclosed in a pressure-tight nitrogen-filled compartment . . . A semi-automatic galvanizing machine, developed by **Malleable Iron Fittings,** makes it possible to maintain consistently a specific quality and coating for pole line hardware and fasteners. Electrical program timers control most important functions of the machine, which can handle rack and basket work simultaneously. The company is now marketing the galvanizing machine . . . **Griscom-Russell** recently delivered a 65-ft, 87,000-lb evaporator to Consolidated Edison's Indian Point nuclear power station. It will produce 65,000 lb per hr of vapor at 62 psi absolute. The evaporator's tandem tube bundles are supplied with steam at 110 psia and 750 deg F. The company is also supplying the nuclear plant's evaporator condensers and condensate coolers.

IMPULSE TESTED







TESTING

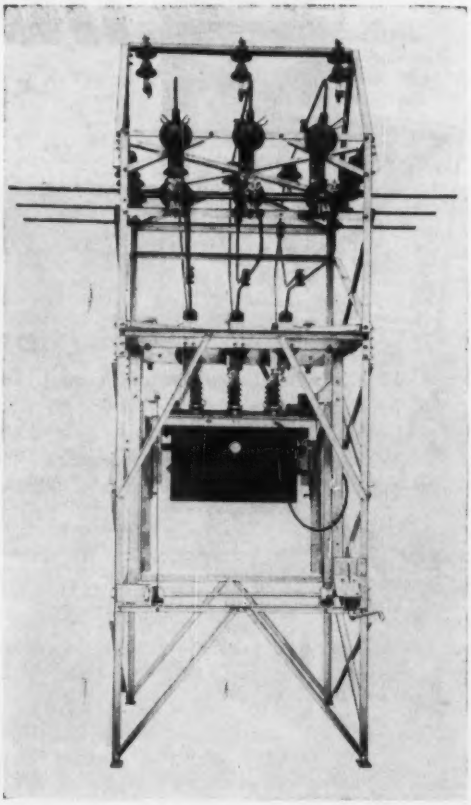
Every R T & E Transformer receives an "on the line impulse test" through use of the most modern equipment and methods known. This test not only insures that the transformer meets NEMA impulse level requirements but also rejects those transformers that are not of maximum quality.

R T & E CORPORATION
WAUKESHA, WISCONSIN
PORTLAND, OREGON

Helping Provide power for America

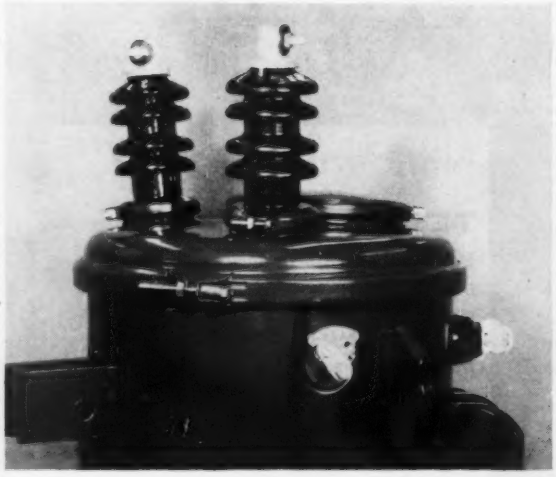
(For further information refer to Reader Service on page 182)

Open-Type Substation Unit . . . ▸



. . . simplifies substation construction by combining secondary bus, oil circuit recloser, bypass switches, arresters, and outgoing circuit attachment in one compact assembly. Units are rated for lines with phase-to-phase voltages up to 15 kv. Kyle Type R or W reclosers can be installed, providing interrupting capability up to 200 mva. Circuits can serve continuous loads of 560 amp. BIL is 110 kv. Manually operated mechanical interlock assures that recloser is tripped during raising or lowering operations.

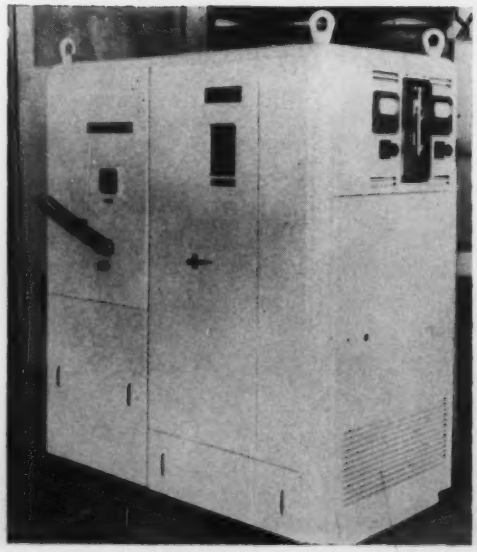
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.



◂ Distribution Transformers . . .

. . . with two high voltage ratings are converted by externally operated series-multiple switch. Typical dual ratings are 2,400/7,200, 2,400/7,620, 4,800/7,620, and 7,200/14,400 v, all with 120/240-v secondaries. They are offered in ratings through 100 kva, either conventional or self-protected. Intended for de-energized operation only, the switch is mounted on the tank above the oil level.

General Electric Co, Schenectady 5, N. Y.



◂ Dry-Type Power Centers . . .

. . . are now available in ratings up to 500 kva, for use in applications up to 5,000 v. The 500-kva unit including load-break switch and panelboard, is 75 in. high, 69 in. wide, and 40 in. deep. Total weight is about 5,200 lb. Unit is quiet and has improved mounting techniques.

Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.

(*More New Equipment on page* 78)

BUILT-IN RUGGEDNESS

FARGO "5000" *Series* CONNECTORS*

Ask your Line Material Field Engineer for complete details.

THE ORIGINAL VISE-TYPE CONNECTOR

- ***Grips like a vise . . . because it is built like a vise.*** The Fargo "5000 Series" Connectors feature the one-piece . . . vise type design that tightens smoothly and stays tight. This original vise-type connector is the basis of the complete line of Fargo Connectors for copper or aluminum. They are fast and easy to apply and all "series" can be installed with "hot" tools.

You get better connections with Fargo Connectors . . . easier . . . faster . . . smoother . . . surer . . .

Fargo "vise type" one piece connectors are available for copper to copper, aluminum to aluminum and aluminum to copper connections from 8 sol through 1,000,000 CM.

* Patented

Distributed by
LINE MATERIAL INDUSTRIES
(A McGraw Edison Company)
Milwaukee, Wisconsin
In Canada: CANADIAN LINE MATERIALS, LTD., Toronto, Canada

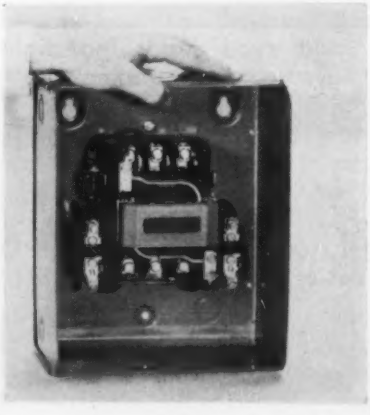
Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

Digging Blades . . .

. . . for pole hole diggers are constructed with carbide cutting edges. Designed for use in frost, hardpan and other severe conditions, the blades will dig holes faster and last longer than conventional frost-type blades.
Tel-E-Lect Products, Inc, 10001 Minnetonka Blvd., Minneapolis 26, Minn.

Motor Starter . . .

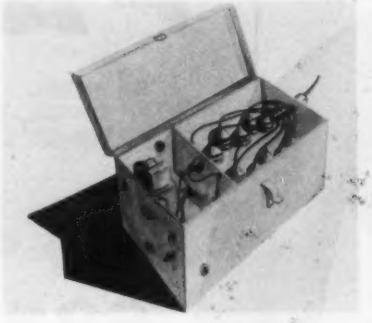
. . . is 34% smaller than previous open forms and 14% smaller than previous enclosed forms. The NEMA Size 2 magnetic unit is rated



25 hp at 440/600 v. It contains an arc trap of a magnetic steel to contain and quench arcs quickly. Straight-through wiring and pressure-type terminals save wiring time.
General Electric Co, Schenectady 5, N. Y.

Vertical Motors . . .

. . . are available in all-weather models from 1 to 30 hp. The Climatized Vertical Hollow Shaft Motors, suitable for condenser cooling, offer greater compactness for space savings and handling ease. In-the-field assembly or removal of coupling and thrust bearing may be completed in 5 min using only a wrench. For bearing protection, units have oil-metering system, sealed bearing chambers and Alnico magnet drain plugs to collect foreign ferrous particles.
Louis Allis Co, Dept P, Milwaukee 1, Wis.

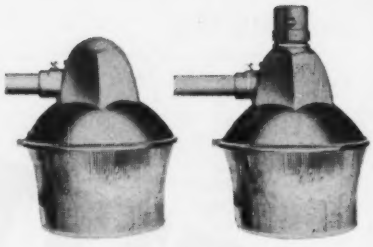


Sampling Kit . . .

. . . permits easier collection of dust samples from stacks. Twelve samples are automatically collected by the Process Sequential Sampler in sequence on 2-in. filter disks. Air may be sampled at a rate of 2 to 4 cu ft per min depending on the accessory vacuum pump used.
Gelman Instrument Co, Box 86, Chelsea, Mich.

Power Pack . . .

. . . combines silicon charger and low-maintenance battery for dependable switchgear tripping and control. The AutoCal Unitized Power-Pack provides a battery and charger combination specifically engineered for this application. The unit offers mounting versatility to fit requirements of all new and existing switchgear installations.
C & D Batteries, Inc, Washington & Cherry Sts, Conshohocken, Pa.



Luminaire . . .

. . . is available with or without photoelectric control. Designated Line 3C1, the Suburbanaire fixture is economical for rural lighting requirements. It is available in IES Type I, II, 4-way type II, III and V. It will accommodate medium or mogul base incandescent lamps in sizes through 405 w.
Line Material Industries, McGraw-Edison Co, South Milwaukee, Wis.

Lighting Standard . . .

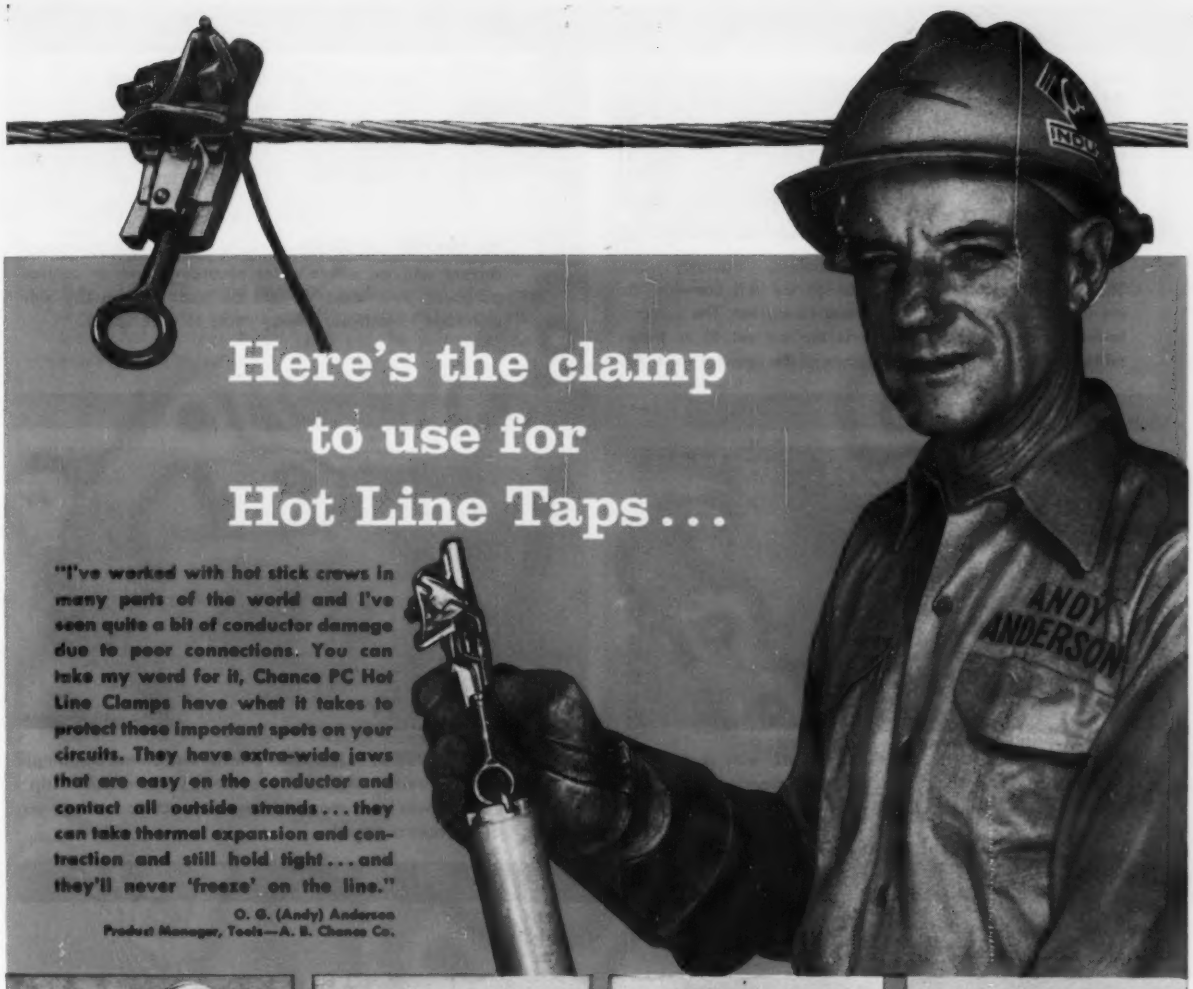
. . . in a cantilever design has modern styling to reduce installation and maintenance problems. Available in steel and aluminum, the "Classic" can be rotated 360 deg. It is offered with arms 4, 6, 8 and 10 ft in both steel and aluminum.
Kerrigan Iron Works, Inc, Box 479, Nashville, Tenn.

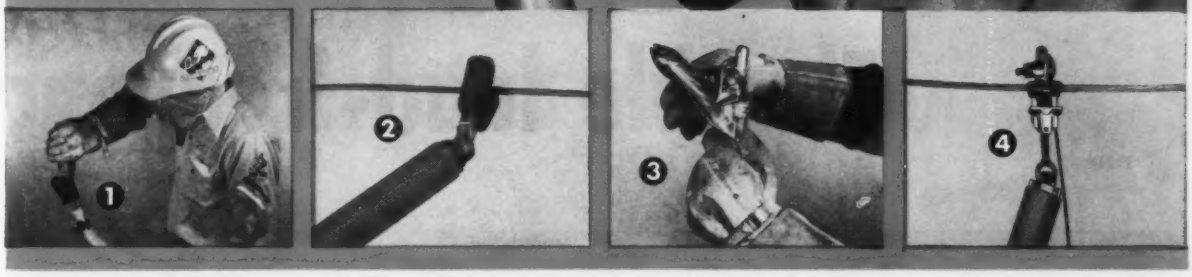
More New Products

Miniature **signal lamp** is designed for use on dispatcher's boards. It is well adapted for mounting on perforated metal boards where the perforations are made on ¼-in. centers on a square pattern or $\frac{5}{16}$-in. on a staggered pattern.—Power Dispatchers Equipment Co, Box 1947, Milwaukee 1, Wis.

Tag protector of clear plastic prevents weather damage to tags used on equipment on outdoor installations.—Bedford Products, Inc, Box 36, Roanoke, Va.

Crane hoist **controller** provides advantages of dc performance on ac cranes. Known as type HWR, the controller utilizes silicon rectifiers.—Electric Controller & Mfg Co, 4500 Lee Rd, Cleveland 28, Ohio.


Here's the clamp
to use for
Hot Line Taps...
"I've worked with hot stick crews in many parts of the world and I've seen quite a bit of conductor damage due to poor connections. You can take my word for it, Chance PC Hot Line Clamps have what it takes to protect these important spots on your circuits. They have extra-wide jaws that are easy on the conductor and contact all outside strands... they can take thermal expansion and contraction and still hold tight... and they'll never 'freeze' on the line."
O. O. (Andy) Anderson
Product Manager, Tools—A. B. Chance Co.
ANDY
ANDERSON



...and here's the way to get a lineman's cooperation in making trouble-free connections

Make it as easy as possible to apply clamps with **z.l.n. 100** by buying Chance clamps packaged with this *Contact Aid* pre-applied. Our engineering research and our experience with many utilities has taught us that Chance **z.l.n. 100** *Electrical Contact Aid* and a wire brush are the first requirements in making a long-lasting hot line tap. 1. Apply **z.l.n. 100** *Contact Aid* to the conductor cleaning brush. 2. Wire brush the contact area of the conductor to remove surface oxides and to apply the corrosion inhibiting *Contact Aid*. 3. Remove the plastic package from a Chance "Protected Connection" Clamp—(the *Contact Aid* is pre-applied to a factory-clean clamp). 4. Install the clamp—It's specially engineered for hot line taps that will let you give your customers continuous electrical service without danger of burn-downs and allow you to easily remove the service if necessary.

Chance "Protected Connection" Type PC Clamps are available in a complete range of sizes that can take from No. 6 ACSR to 1,431 MCM ACSR and comparable sizes of copper conductor. There's a type for every contact combination—including the Chance AGP with heavy fortified cadmium coating for additional protection on bimetal connections.

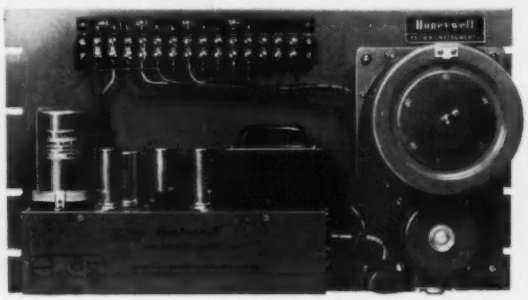
ABC INDUSTRIES

A. B. CHANCE COMPANY General Offices CENTRALIA, MISSOURI

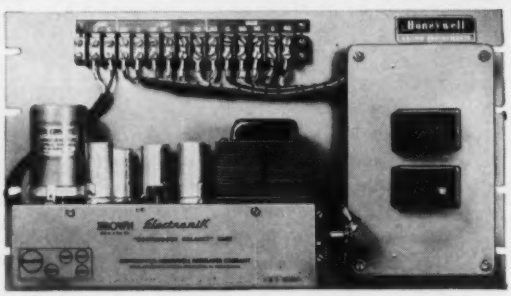
CC59-4

TELEMETER TRANSMITTER is tubeless, frequency type. The millivolt-to-current transducer on the left converts the mv signal from the sensing element to current. The current-to-frequency transducer converts the current to a transmittable frequency that is a measure of the original variable.

TELEMETER RECEIVER converts signal from frequency to current and/or millivolts for recording and/or controlling purposes. Two receivers can be mounted side by side in standard 19-inch-wide relay racks to save space.

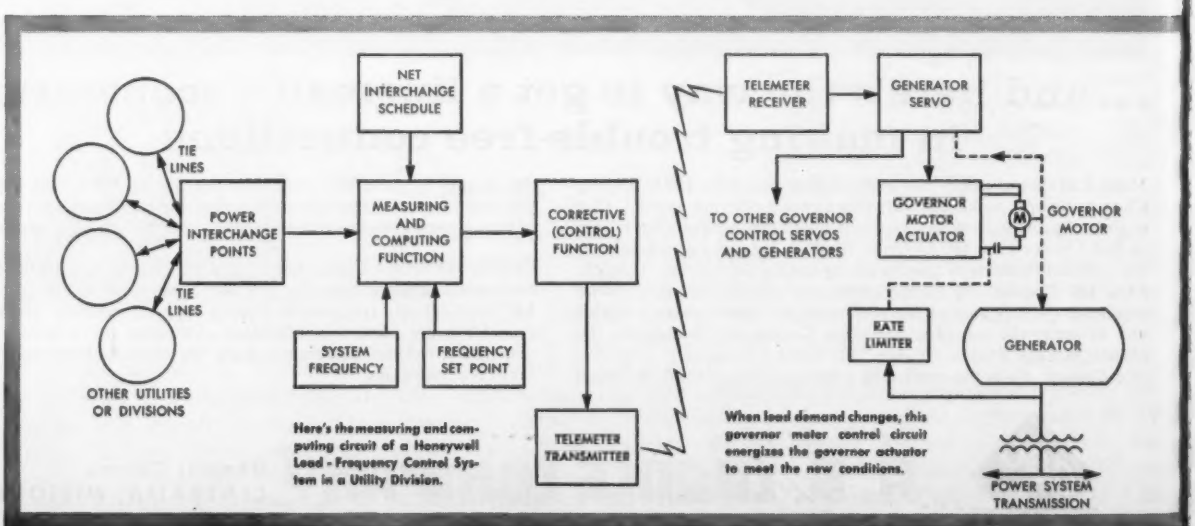


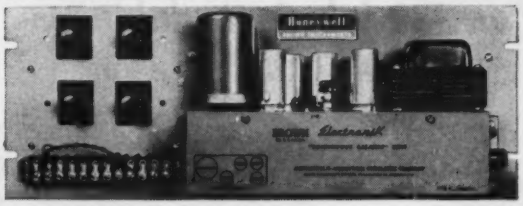
***ELECTRONIK* SERVO CONTROL UNIT** with components mounted on a standard 19-inch panel. Balancing motor is at lower right, and up to three gang-mounted slidewires are at upper right.



***ELECTRONIK* ALARM SERVO** includes an electronic amplifier and two relays which actuate the audible, visual or trip circuits. These rack-mounted servos react to settings made at the control console.

Flexible load-frequency c


NET INTERCHANGE SCHEDULE
TIE LINES
POWER INTERCHANGE POINTS
TIE LINES
OTHER UTILITIES OR DIVISIONS
MEASURING AND COMPUTING FUNCTION
SYSTEM FREQUENCY
FREQUENCY SET POINT
CORRECTIVE (CONTROL) FUNCTION
TELEMETER TRANSMITTER
Here's the measuring and computing circuit of a Honeywell Load - Frequency Control System in a Utility Division.
TELEMETER RECEIVER
GENERATOR SERVO
TO OTHER GOVERNOR CONTROL SERVOS AND GENERATORS
GOVERNOR MOTOR ACTUATOR
GOVERNOR MOTOR
RATE LIMITER
GENERATOR
When load demand changes, this governor motor control circuit energizes the governor actuator to meet the new conditions.
POWER SYSTEM TRANSMISSION



RATE LIMITER senses the rate at which generation changes and permits fast rates of change over an allowable narrow band but restricts larger changes to a predetermined number of MW/Min.

GOVERNOR MOTOR ACTUATOR adjusts generation to meet the demands of a changing load. This solid state unit eliminates the need for relays.

- High-speed telemetering and control
- Continuous, economic loading with linear control action
- Penalty factor adjustment
- Continuous, simultaneous fringe and sustained control
- Control accuracy unaffected by voltage change and phase shift
- Small space requirements, low installation costs
- Easily expandable to control of interconnected systems
- Continuous heat-rate curves through full regulating range
- Positive rate limiting on each generator
- Solid state governor motor actuator
- Available with or without line loss and cost computer

y control grows with you

Use Honeywell load and frequency controls for accurate generation and interchange schedules . . . and greatest savings. This completely electronic control uses highly stable, dependable servo circuits. High precision and swift response—plus exceptional built-in flexibility—give the operator fingertip control over load distribution between stations, between individual generators in each station, and between his system and interconnections.

Individual control consoles for system or station operators are custom-engineered. They incorporate simplified means for setting up and automatically maintaining incremental loading schedules based on various generation efficiencies. System control can be flat frequency, flat tie line, or tie line bias . . . whichever the dispatcher prefers for any area.

Standard, field-proved units, some shown above, provide the flexibility to engineer a system to your specific requirements . . . and to expand your system as your requirements increase.

Your nearby Honeywell field engineer will be glad to discuss your particular requirements. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Control

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below.

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Westinghouse .... Power Centers ☐
Tel-E-Lect ..... Blades ☐
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OTHER

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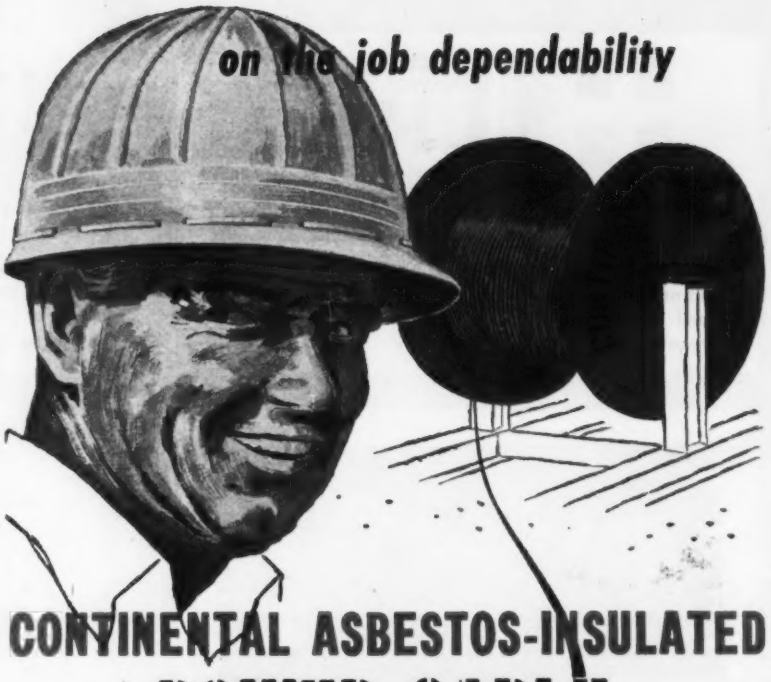
APRIL 27, 1959



CONTINENTAL ASBESTOS-INSULATED
POWER CABLE

***TYPE AVA TO 5000 VOLT SERVICE** available sizes: 14 AWG to 1,000,000 CM inclusive. Conforms to N.E. code standard and NEMA standard WC1-1955 and ASA C8.-36-1955.*

Engineered insulated wire and cable from Continental Wire assures maximum Job-Dependability.

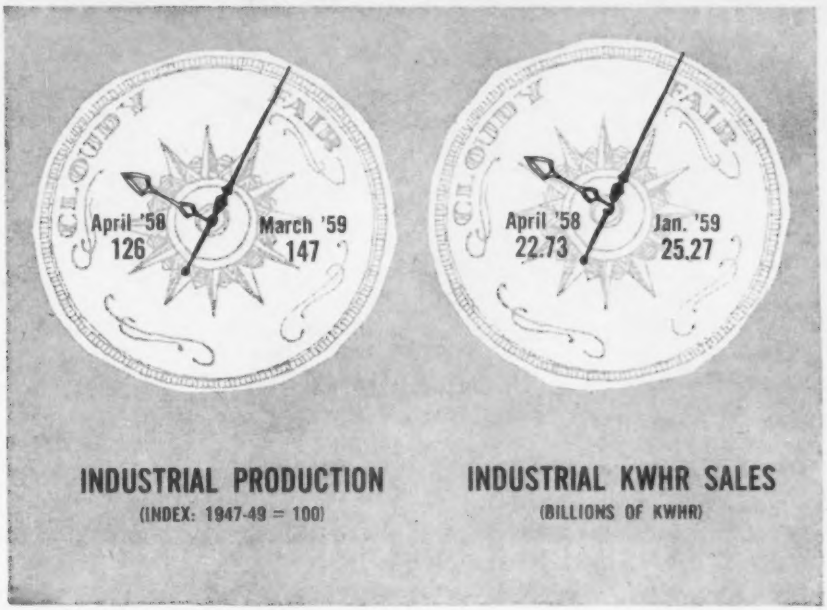
Type AVA Power Cable is recommended for use in open or in conduit installations where advantages of excellent current carrying capacity and resistance to high temperature are desired . . . and where operating conditions include oil, grease, corrosive vapors or moisture.

There's a complete line of Continental Insulated Power Cable in sizes 14 AWG to 1,000,000 CM inclusive . . . insulation types include AVA . . . AIA . . . V . . . AVB . . . Silicone Rubber . . . Glass . . . Teflon Tape . . . and Varnished Glass Tape.

For more information write Continental, Wallingford.

continental wire corporation

WALLINGFORD, CONNECTICUT • YORK, PENNSYLVANIA



After a year of recovery . . .

Business Barometers Still Rise

Report on
Electrical Business Outlook

Business barometers are indicating the fairest weather in many months. The latest batch of economic indicators—from industrial production through housing starts to capital spending—show that recovery from the recession is still proceeding at a healthy pace. In some quarters, in fact, prophets of "boom" are creeping out of the shelters they have occupied for the past two years.

The tyranny of statistics over present economic thought is demonstrated by the last few months' reports on industrial production issued by the Federal Reserve Board—and to some economists' reaction to them. After bounding up from its April '58 low of 126 to a November mark of 141, the industrial production index had seemed about to level off. Rises of only one point a month were recorded in December and January. When the February gain was reported as only one point, some observers proclaimed that the recovery had lost its steam.

The latest FRB report, however, gave these theorists a one-two punch. First, the board revised its February index upward by a point. This meant a two-point gain to 145. Second, it announced that the index had scored another two-point gain in March—breaking through the pre-recession peak to a new high of 147.

The acceleration in industrial production since the beginning of the year is not enough to prove that all's well with the economy, any more than the unrevised figures proved a slowdown in the recovery. But the latest readings from several other barometers plus spot reports from the areas hardest hit by the recession combine to provide the firmest ground yet on which to base an optimistic forecast of business conditions in the months ahead.

Industrial kwhr sales snapped out of the doldrums in December, totaling more than 25 billion kwhr and running 6.3% above the year-earlier month. January saw sales at about the same level, and 6.6% ahead of a year earlier. Spot indus-

These Six Business Barometers

STEEL OUTPUT
THOUSANDS OF TONS

Low (April 1958): 5,533

Latest (March 1959): 11,567

Forecast: Falling in 3d Qtr, Rising in 4th Qtr

HOUSING STARTS
MILLIONS, ANNUAL RATE

Low (Feb. 1958): .915

Latest (March 1959): 1.390

Forecast: Steady

RETAIL SALES
$ BILLION, SEASONALLY ADJUSTED

Low (March 1958): 16.1

Latest (March 1959): 17.7

Forecast: Rising

trial sales totals from cities caught tightest in the recession's grip indicate that the trend is still on: Detroit Edison Co announced industrial use for week ended March 21 was no less than 35.7% higher than the corresponding week in 1958.

Most spectacular recovery of all has been made by the steel industry. Last month's output of 11.5 million ingot tons was more than double the figure for April 1958. A year ago this month, the steel industry was operating at 48% of its capacity as of the beginning of 1958. By the middle of last month, the steel rate was running at 92% of the higher capacity in place at the beginning of 1959. And the Federal Reserve Board reported last week that the pitch of operations had risen still higher, to 93% of capacity.

This feverish activity in the steel mills can't all be laid to better business, of course. The threat of a steel strike after June 30 contract expiration date hangs over the heads of a substantial portion of the U. S. manufacturing industry as well as the steel companies themselves, and manufacturers who depend on a ready supply of steel have been building up their inventories since the first of the year. This inventory buildup insures that steel operations will fall off in the third quarter, whether or not there's a strike.

In spite of its effect on the steel industry's summer operations, however, the inventory buildup bodes well for business in the third quarter. First, the size of the buildup is a practical vote of manufacturers' confidence that the upturn is not petering out. Second, economists estimate that users will have enough steel on hand by the time the deadline rolls around to keep them busy through a steel strike up to six weeks long. This means that it will take an unpopularly long walkout to put a serious crimp in the rest of the economy.

Meanwhile, housing starts have reached boom proportions. More units were started in the first quarter of 1959 than in any previous first quarter. Private starts in March rose to a seasonally adjusted annual rate of 1,390,000, running the first quarter rate up to 1,353,000—about 25,000 units better than the all-time high set in 1955. Improvement over the recession low in February 1958 has already exceeded 50%, and chances are starts won't fall much below the

Indicate the Progress of Recovery

PERSONAL INCOME
$ BILLION, ANNUAL RATE

Low (Feb. 1958): 347.5

Latest (March 1959): 368.6

Forecast: Rising

CAPITAL SPENDING
$ BILLION, ANNUAL RATE

Low (3d Qtr 1958): 29.6

Latest (1st Qtr 1959): 31.2

Forecast: Rising

KWHR OUTPUT
BILLION KWHR

Low (April 1958): 49.5

Latest (March 1959): 57.6 est.

Forecast: Rising

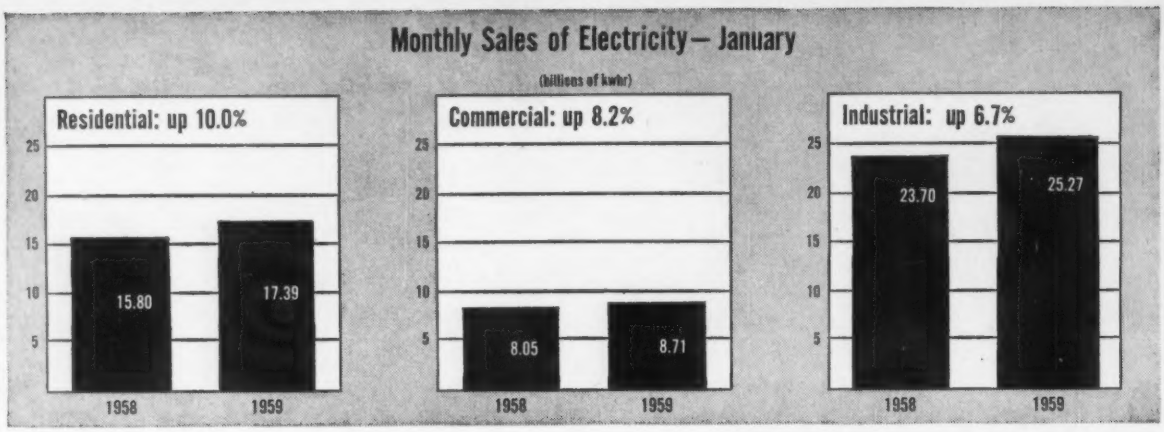
present rate. Labor Dept says building permits, which show up as statistics before housing starts themselves, indicate strong gains throughout the nation.

Retail sales also broke into new high ground in March. Dept of Commerce put the seasonally adjusted total at $17.7 billion—up 10% over the recession low of $16.1 billion a year earlier. Durable goods sales also hit a new peak in March —not quite 20% above the March '58 low.

And sales are not likely to fall with personal income at a new peak. The March annual rate (seasonally adjusted) hit $368.6 billion. This was the third month of record breaking figures. The fact that March incomes were only 6% above the low water mark of February 1958 is no reflection of a slow rate of recovery, since consumer income was one barometer that stayed high throughout the recession. With employment rising steadily—if slowly—and dividend hikes becoming more frequent, the trend in personal income looks like a good bet to continue on the upside through the rest of the year.

Last, but not least, capital spending has finally turned around. Money spent by business for new plant and equipment is usually among the last barometers to fall when the economy turns down, and one of the last to recover after the upturn. In 1958, capital spending did not begin to fall off in earnest until the earliest of the leading indicators had already started transmitting the first weak signals of the upturn. It continued to fall, however, for six months after the trough of the recession had been reached. But the Dept of Commerce reports a solid rise of 4% between the last quarter of '58 and the first quarter of '59; and the McGraw-Hill Dept of Economics' latest survey of business' plans for new plants and equipment (EW, April 20, p 76) shows a 7% increase in capital spending slated for the year 1959.

Latest word from utilities is also encouraging. Reported generation totals for the first four weeks in March point to kwhr output for the month of about 57.6 billion kwhr. This is 16% above the low last April, and there have been no indications that this barometer of business intends to fall in the months ahead.



Power Statistics

		Latest Month	Year Ago	Annual Change %
Capacity, Peak—Class I Systems, Estimated Dec. '59 Peak — million kw	Jan.	143.80	129.70	10.9
	Dec.	107.1	102.4	4.6
	Jan.	125.0	129.1	− 3.2
Production—billion kwhr	Jan.	59.94	55.36	8.3
Hydro		11.29	12.52	− 9.8
Fuel		48.65	42.84	13.6
Sales—billion kwhr	Jan.	54.11	50.06	8.1
Residential		17.39	15.80	10.1
Commercial		8.71	8.05	8.2
Industrial		25.27	23.70	6.6
Other		2.74	2.51	9.2
Fuel Consumption	Jan.			
Coal—million tons		16.15	14.80	9.1
Oil—million barrels		9.98	7.26	37.5
Gas—billion cu ft		86.83	81.77	6.2
Net Income Class A & B Co's—$ million	Jan.	156.14	137.24	13.8
Residential Customers—millions	12 mos.	47.79	46.86	2.0
Revenue per kwhr	ended	2.53¢	2.56¢	− 1.2
Avg kwhr per customer	Dec 31	3,366	3,174	6.0
Avg annual bill		$85.16	$81.25	4.8

Business Statistics

Indexes: 1947–49 = 100				
FRB Industrial Production	March	149	129	15.5
ENR Construction Cost	April	164.4	156.3	5.2
BLS Cost-of-living	Feb.	123.9	122.5	1.1
New Orders for Machinery (1950 = 100)	Feb.	183	124	47.6
NEMA Sales				
Insulation materials	Jan.	130	116	12.1
Electric appliances		88	74	18.9
Wholesale prices				
Motors and generators	Jan.	146.4	143.4	2.1
Transformers and regulators		148.8	148.7	0.1
Switchgear and fuses		172.0	172.3	0.2
GNP—annual rate—$ billion	4th qtr	453.0	438.9	3.2

Significant changes: New orders for industrial machinery rose to new record high in February, reaching 183 on the McGraw-Hill Economics Dept's index. Previous peak had been 161, in March 1957.

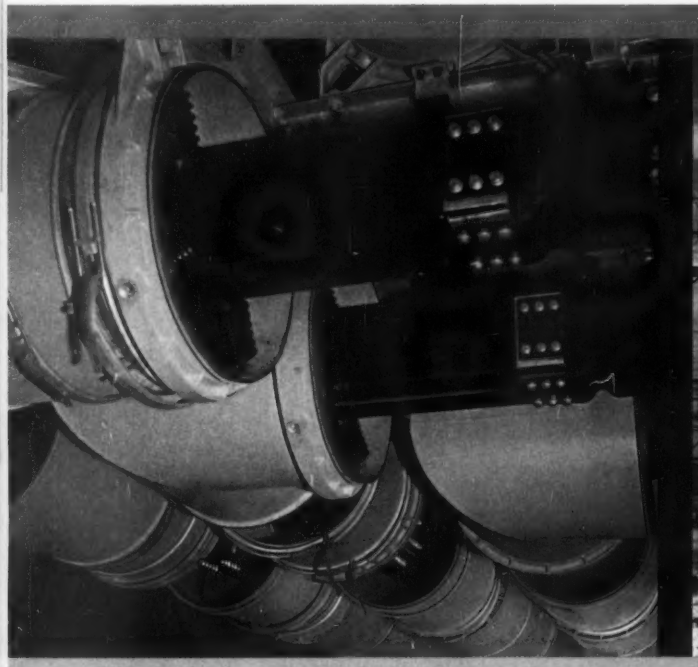
Pacific Gas and Electric Company's Morro Bay Power Station is an outstanding example of clean, modern lines achieved with ribbed walls of Alcoa Aluminum.

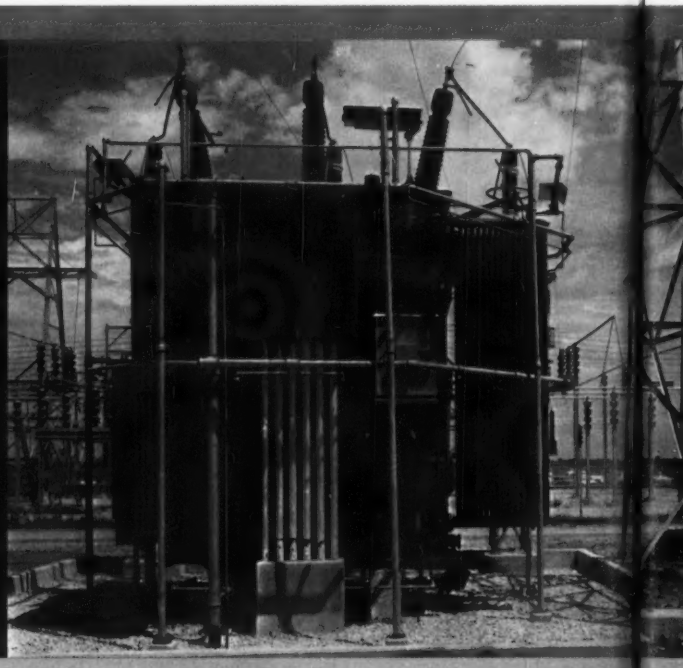
ALCOA RESEARCH

. . . development today for tomorrow's loads

HOW ALCOA ALUMINUM REDUCES COSTS IN GENERATING STATIONS

ALCOA'S THREE-PRONGED ASSAULT ON POWER STATION COSTS





ARCHITECTURAL APPLICATIONS

There are three outstanding reasons why Alcoa Aluminum is the ideal building material for generating stations: low cost, freedom from maintenance and attractive appearance.

Walls of Alcoa Aluminum, uninsulated or sandwich type, go up fast. They require less supporting steel and a lighter foundation. They never need painting. Yet *sandwich wall of Alcoa Aluminum is the lowest cost, insulated metal wall system available.* Savings are also found in roofing, windows, conveyor framing and covers, handrails, grating, tread plate, fencing and many other applications. In every case, strong, lightweight Alcoa Aluminum offers a substantial bonus in corrosion resistance and permanent good looks.

Right: Maintenance-free beauty . . . Duke Power Company's Allen Plant at Belmont, North Carolina.

Through the years, Alcoa has adapted aluminum to new uses in power stations in three areas: electrical, architectural and mechanical. In every case, the objective has been the same: to reduce costs while advancing standards of performance. The result today is virtually an "all-aluminum" power station from conductors to condenser tubes, siding to stair treads. Everywhere you look, aluminum is helping utilities produce more kilowatts per dollar.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

ALCOA RESEARCH

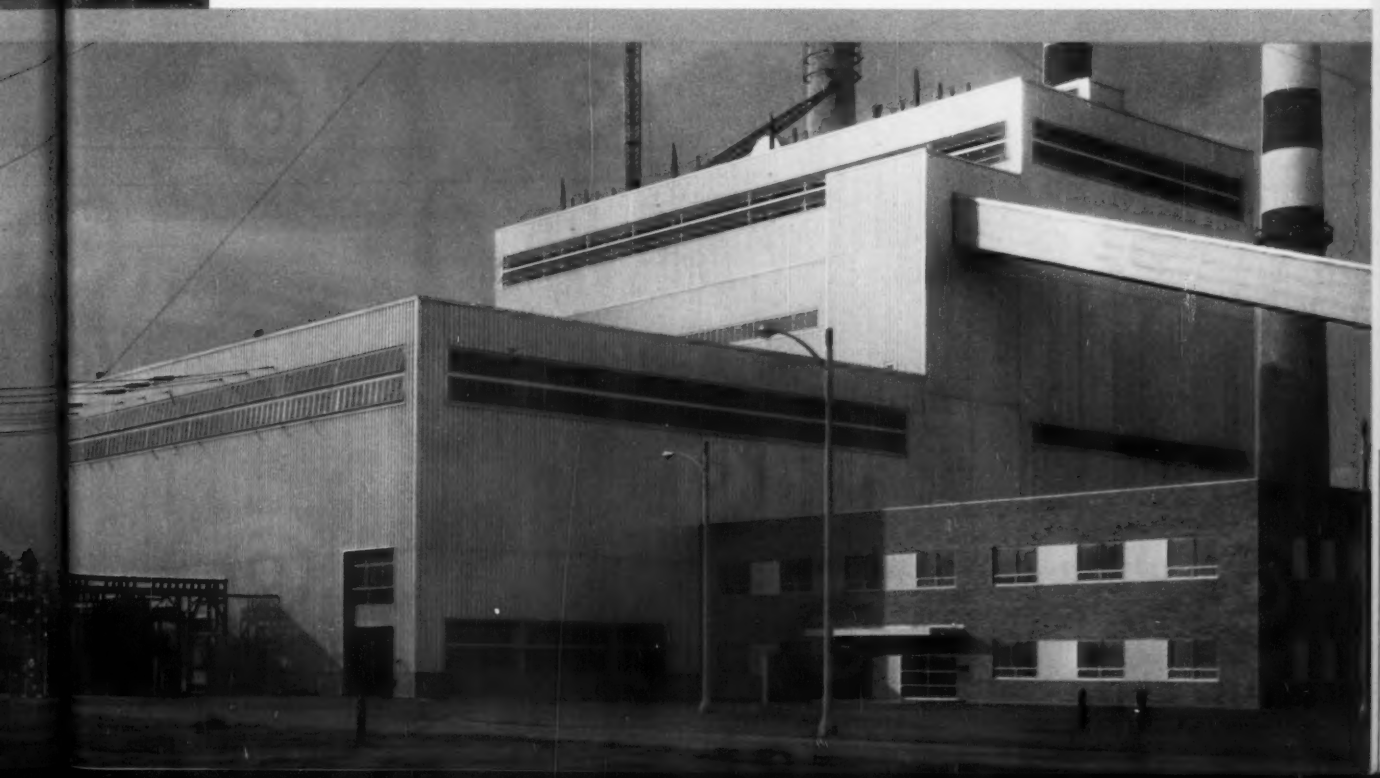
. . . development today for tomorrow's loads

ELECTRICAL APPLICATIONS

The same economy that accounts for almost universal acceptance of aluminum in overhead lines is yours if you specify aluminum for your power station. Alcoa® Bus Conductor, for example, is saving utilities many thousands of dollars, since an equivalent installation costs about one-half as much as copper. Conduit, crossarms and structures, cable, generator field windings, switchgear and isolated phase bus and enclosures, transformer windings and yoke end plates all represent opportunities for savings with Alcoa Aluminum. Soon transformer tanks and radiators will be available in aluminum. All these applications pay major dividends in lower maintenance costs, longer life and higher efficiency.

Left: Alcoa Rigid Conduit is used on this transformer at Kansas City Power & Light Company's Montrose Steam-Electric Generating Station.

Far left: Isolated Phase Bus made by Delta Star Division of H. K. Porter Co., Inc., with Alcoa Integral Web Channel Bus connected with aluminum bolts, aluminum enclosures and cast aluminum support rings at Commonwealth Edison Company's Fisk Station.



MECHANICAL APPLICATIONS

Among the foremost mechanical applications of aluminum are heat exchanger tubes. Low cost, as much as 50 to 60 per cent below other tubes, is combined with long life and superior resistance to carbon dioxide, hydrogen sulfide and ammonia. Moreover, heat transfer characteristics are equal to the best of competitive metals.

Aluminum's resistance to corrosion also accounts for major economies in condensate storage tanks, since no maintenance is required inside or outside and no iron is introduced into boilers.

In numerous applications including control tubing, tanks, covers, boiler lagging, jacketing, panels, canopies and low-pressure feedwater heaters, aluminum can help utilities to save on initial cost, on maintenance, through longer service—or all three.

Condenser tubes of Alcoa Aluminum being installed in an Allis-Chalmers Mfg. Co. surface condenser at The Detroit Edison Company's St. Clair Station.

FREE...

Find out more about the use of aluminum in power stations. *Alcoa Aluminum for Generating Stations* is a new booklet listing many of the latest applications of aluminum in this field—electrical, architectural and mechanical—and containing a complete list of all Alcoa literature available on each of these subjects. It's "must" reading for every cost-conscious utility executive. For your copy, write Aluminum Company of America, 2110 Alcoa Building, Pittsburgh 19, Pennsylvania.

For more information on *any* application of aluminum in the electrical industry, call Alcoa.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

ALCOA RESEARCH

. . . development today for tomorrow's loads

For Exciting Drama Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

Electric Range Doubles As Space Heater

A new appliance that combines the advantages of cooking and heating has been devised at the Waterbury District of The Connecticut Light & Power Co. The Electric Kitchen Heating Range was dreamed up by D. W. Price, CL&P Western Division manager, and the operational parts were put together by O. J. Campeau, chief serviceman at Waterbury.

Shown in the photo are, left to right, Campeau, Price, M. T. Roberts, assistant district residential sales manager, and W. J. Dunne, district residential sales manager.

The basic range used for conversion was a "40 Frigidaire." The heating system is made up of three Chromalox Finned Black Heat units with a rated capacity of 1,550 w for each unit. Total heat output is 16,000 Btu's an hour. Total load for the range and heaters is approximately 20 kw.

The heating unit is thermostatically controlled at room temperature and there is a separate fan control on the air duct. The fan goes on automatically at 150F. It was pointed out that the air duct could be placed on the side, front or top of the range depending on the individual need.

The appliance could be the answer to supplemental heating for chilly kitchens and nearby rooms, as well as for use in summer cottages, Price says. "There is really no limit to the application of this range."

Price forsees a bigger use for the electric range than the Two-Service gas range which he and CL&P pioneered 25 years ago. Since 1957 in the Waterbury district, company sales have been running at a ratio of 2 to 1 over the regular gas range, and dealer sales show a similar ratio.

Complete information is available from The Connecticut Light & Power Co, 250 Freight St, Waterbury, Conn.

Table Settings—Housewares Promotion Devised by BH&G

A table settings-electric housewares promotion which will entice housewives with the idea that electric housewares are attractive enough to be moved out of the kitchen and are a perfect addition to a table setting has been devised by Better Homes & Gardens Magazine.

The "Attractive Table Settings with Electric Housewares" promotion is offered exclusively to a utility for the area served by the company and its subsidiaries and/or distributor-dealer organizations.

Better Homes & Gardens will supply free promotional material—portfolios with illustrations of the use of electric housewares with modern table settings, display posters, and newspaper tie-in mats. Additional promotional material available on request includes filmstrips and an "ideas" booklet. BH&G will also notify electric housewares manufacturers of the utility's participation in the promotion.

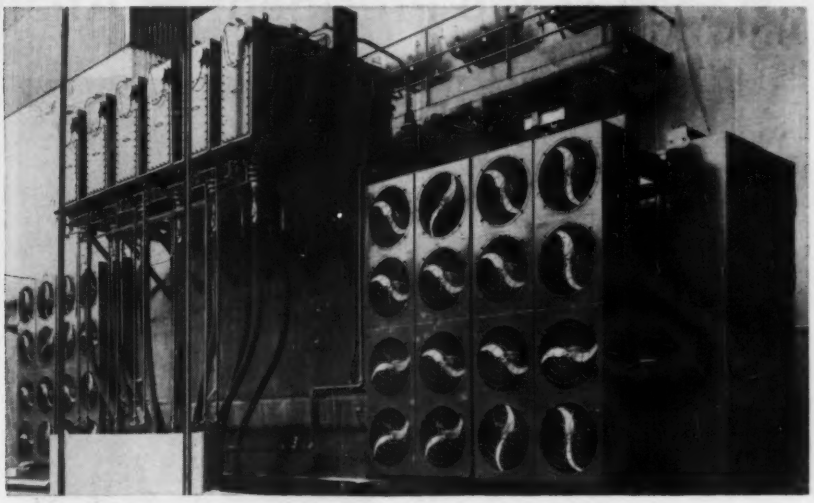
In return, the utility will have to use and promote a minimum of six displays throughout 1959, use a minimum of ¼-p of newspaper advertising, or its equivalent on radio or TV to promote each display, and use BH&G advertised products in the display wherever possible.

The filmstrip costs $10.00. The booklets: 1-99 copies, $.10 ea; 100-499, $.09 ea; 500 or more, $.08 ea.

For details write: P. E. Goodenough, manager, retail advertising, Better Homes & Gardens, Des Moines 3, Iowa.

Mr. S. Bennon, Manager, Westinghouse Large Power Transformer Engineering, and Mr. J. D. Goodwin, Large Power Transformer Sales, examine drawing of world's largest generator transformer, installed at Commonwealth Edison's Fisk Station.

Rated at 69 kv, 380 mva, FOA, this Westinghouse power transformer has two 69-kv windings, each rated at 210 mva, and one 17.2-kv winding rated at 380 mva.



WORLD'S HIGHEST INSTALLED CAPACITY

At 380 mva, the Westinghouse generator transformer at Commonwealth Edison's Fisk Station has the highest capacity of any such unit installed.

Here is another step upward toward the super kva banks of tomorrow . . . another step made possible by Westinghouse leadership in power transformer development.

Through the years, Westinghouse design engineers have developed improvements that permit building—and shipping—the higher capacity transformers required by higher and higher generation capacity. Here are some of these developments, and what they mean to the future of electric utilities:

"Form-Fit" construction—Highest mechanical and dielectric strength, to withstand all stresses of shipping, installation and service. Smaller, lighter transformers.

Forced-oil cooling—Increased cooling efficiency, greater capacity from a smaller transformer.

Inner-Cooled construction—Maximum utilization of materials used in conventional transformer construction reduces size and weight up to 15%, permits lower impedances and improved performance.

Insuldur* insulation system—Permits an extra 10% overload beyond your present loading practice with no additional loss of insulation life.

And here are other dollar-saving Bonus Values from Westinghouse Plowback of Earnings into research and development. Lower BIL's with savings in original cost, reduced losses, lower impedance and smaller size; vapor cooling, which combines the safety of dry-types with performance of liquid-immersed units.

*Trade-Mark J-70877

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

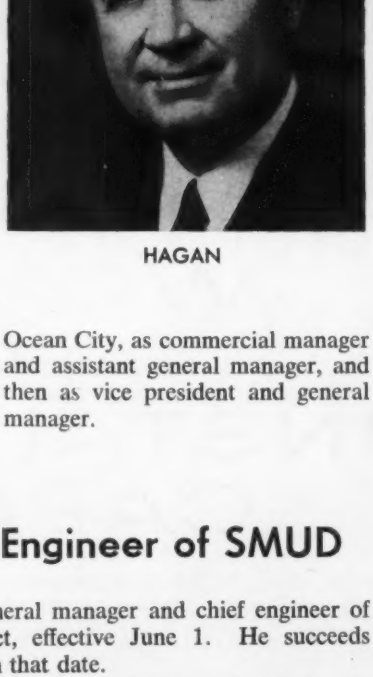
Hagan Made President of Atlantic City Electric

Charles M. Hagan has been elected president of Atlantic City Electric Co. He succeeds Bayard L. England who was elevated to chairman of the board and principal executive officer. He had been president since 1949.

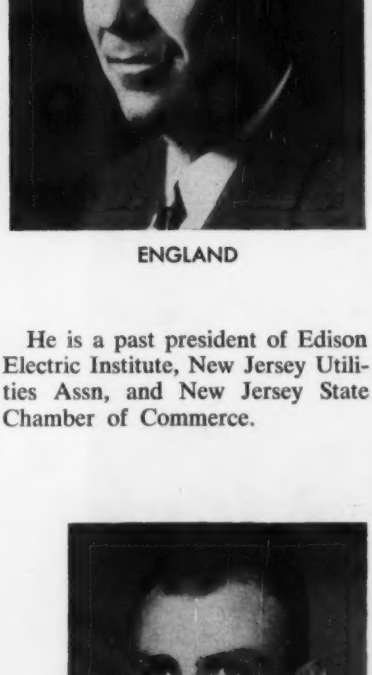
Hagan joined Atlantic City Electric in 1928 as a power engineer after four years with General Electric Co. In 1930, he was appointed district superintendent in Paulsboro, N. J. and then became division manager for the Salem area in 1940.

In 1946, he was made assistant general manager at Atlantic City. He was elected a director in 1947, a vice president in 1949, and executive vice president in 1952. He is a past president of the New Jersey Utilities Assn.

England started with the company in 1922 as a clerk. He served as manager of the central division in Ocean City, as commercial manager and assistant general manager, and then as vice president and general manager.



HAGAN



ENGLAND

He is a past president of Edison Electric Institute, New Jersey Utilities Assn, and New Jersey State Chamber of Commerce.

Shaad Elected Chief Engineer of SMUD

Paul E. Shaad has been named general manager and chief engineer of Sacramento Municipal Utility District, effective June 1. He succeeds James E. McCaffrey who will retire on that date.

Shaad was first employed by the District in July 1945 as electrical engineer. A year later he was appointed chief electrical engineer and held this position until he became assistant general manager and assistant chief engineer in 1954.

McCaffrey has been general manager and chief engineer since August, 1938. Prior to going with the District he was employed by the California Railroad Commission for 18 years.

Jackson Named VP Charge of Sales

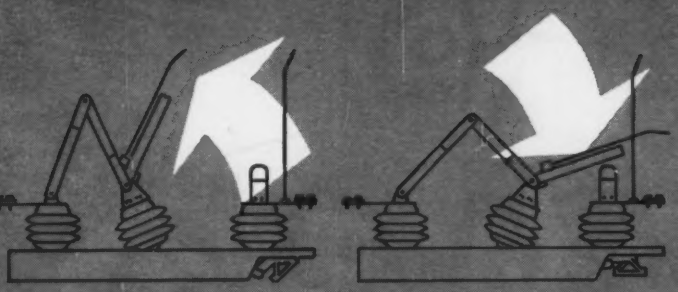
Diamond Power Specialty Corp has elected William H. Jackson vice president in charge of sales. He was formerly assistant marketing manager of Babcock & Wilcox Co's Boiler Division.

Jackson joined B&W in 1936 as a student engineer. In 1946, he was appointed a representative in the company's Philadelphia district sales office. In 1957, he was promoted to assistant sales manager of the Boiler Division. When the company consolidated division operations in Barberton, O., last year, Jackson was appointed assistant marketing manager.

(*More News About People on page* 98)

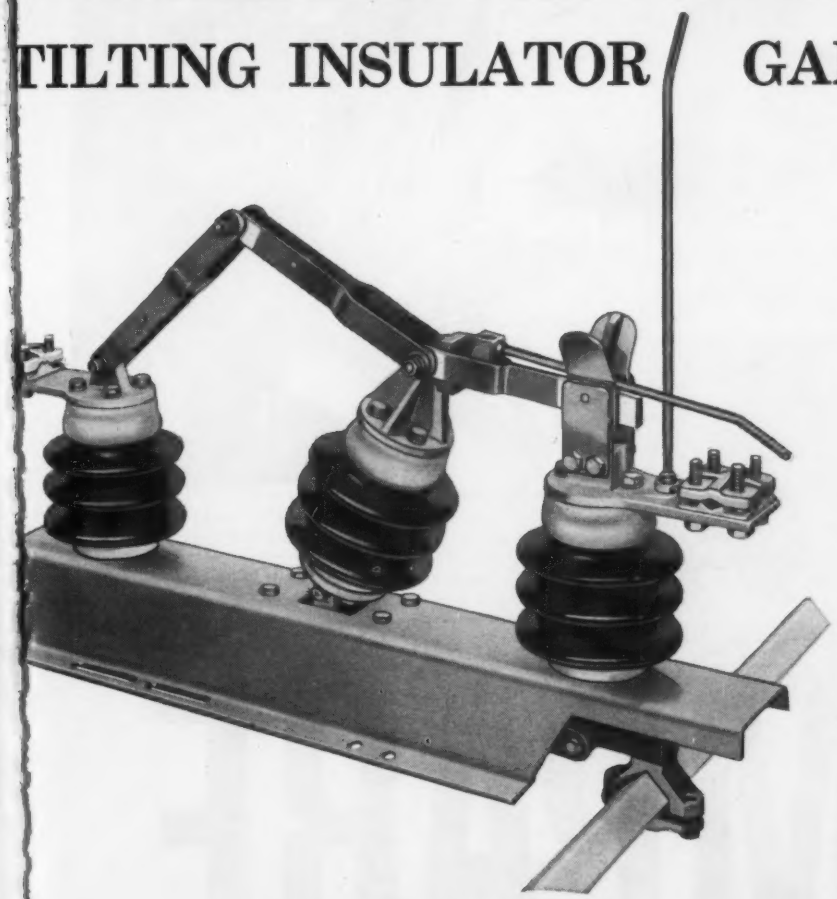
Special **KEARNEY** design for

smooth opening and closing



despite crossarm warpage

TILTING INSULATOR GANG SWITCH



- Switch works smoothly even when crossarms are warped out of alignment, horizontally or vertically, because the specially designed interphase shaft clamp compensates for any structural distortion
- Double leverage frees switch blade of heavy ice coatings: "pry-out" blade action plus toggle action of operating linkage on the tilting insulator
- Longer maintenance-free service in corrosive atmospheres—and in unusually frequent operation—because there is no flexible blade shunt to wear out
- Extra long jaws: adjustment for blade travel need not be critical . . . silver blade to jaw contacts
- Tilting insulator supported by Oilite bearings
- Easy installation . . . interphase shaft can be lifted into clamps after switch is in position

JAMES R. KEARNEY CORPORATION
General Offices: 4224-42 Clayton Ave., St. Louis 10, Mo.

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for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify

JAMES R. KEARNEY CORPORATION ST. LOUIS 3, MO. EVELETH, MINN.

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KEARNEY PRODUCTS

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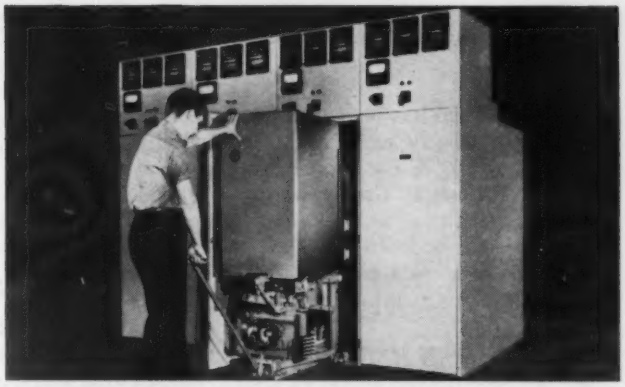
COMPARE

It's easy to see how far I-T-E equipment is ahead of other makes. Just make a point-by-point comparison. Take the new K-LINE circuit breakers for low-voltage switchgear, for example.

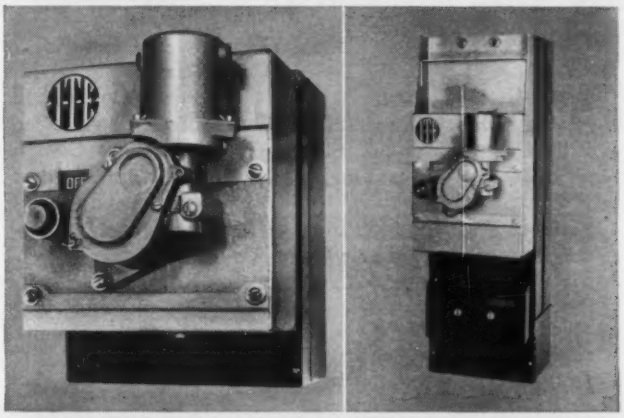
Note the new pulldown handle and stored energy mechanism that give you quick-made closure for longer contact life and greater operator safety. With the front door closed, you can draw the breaker all the way out to disconnect position. And the new expanded range trip adjustment lets every breaker handle a wider range of loads without modification.

In ratings up to 600 amp, these compact circuit breakers stack four high in standard I-T-E enclosures. For added flexibility, you can shift the low rating breakers to the larger enclosures when convenience dictates.

How much more do you pay for all these extra features? Nothing! It's an I-T-E policy. More value for your money.

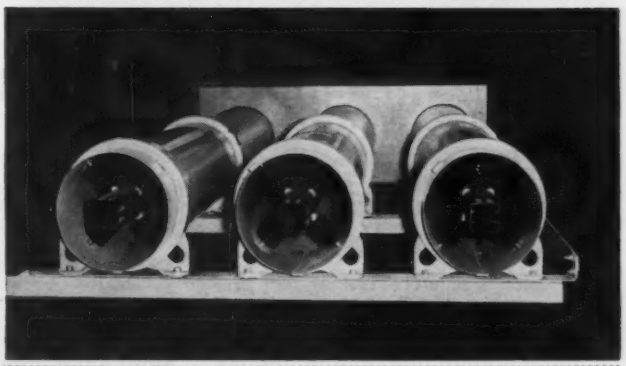


Metal-clad switchgear you can be proud of. Extra sturdiness for longer life. Extra craftsmanship for finer appearance. Extra safety for greater personnel protection. All components are completely accessible. Even rear doors are hinged. Advanced design, uniform-flux-density coils mean extra protection against heavy fault current. A complete line of circuit breakers in both 4.16 and 13.8 kv ratings.



Push a button . . . operate the CORDON.® Here's molded case economy with remote control luxury. New I-T-E CORDON circuit breakers are available with new TELEMAND* motor-operators for remote opening, closing or resetting. CORDON circuit breakers provide up to 100,000 amp interrupting capacity in roughly half the switchboard space required by alternative devices. They cost approximately ⅓ less. TELEMAND operation is available on the complete range of molded case and CORDON circuit breakers from 70 through 800 amp.

**Trademark, I-T-E Circuit Breaker Co.*



Safer, more compact main bus. Not a single case of phase-to-phase short circuit has ever been reported on I-T-E Isolated Phase Bus since I-T-E introduced it 22 years ago. Such performance is proof of good design and consistently high-quality construction. I-T-E uses cylindrical enclosures for superior heat dissipation, easier gasketing, lower cover losses, better shape retention with internal pressure, and saving in weight. Sliding covers permit easy inspection. Full line of auxiliary equipment available. Ratings from 4.16 to 34.5 kv and through 20,000 amp.

SEND COUPON

Get complete, up-to-date information on I-T-E equipment.

I-T-E Circuit Breaker Company U-4

1900 Hamilton St., Philadelphia 30, Pa.

- ☐ K-LINE LV switchgear (600 v)
- ☐ Metal-clad switchgear (4.16 and 13.8 kv)
- ☐ Motor-operated molded case circuit breakers
- ☐ Primary unit substations
- ☐ Other_____
- ☐ Outdoor substation structures
- ☐ Isolated phase bus
- ☐ Reclosers
- ☐ Distribution cutouts

Name_____ Title_____

Company_____

Street_____

City_____ Zone_____ State_____

I-T-E CIRCUIT BREAKER COMPANY

PERSONAL BRIEFS

Oliver E. Owen has been appointed chief right-of-way engineer at the San Diego Gas & Electric Co, succeeding **William F. Garber** who retired recently.

R. M. Shearer, vice president, Mississippi Power Co, retired recently.

Fred I. Smith has been named head of sales department for Jersey Central Power & Light Co and New Jersey Power & Light Co.

Southeastern Electric Exchange has elected **F. Hugh Coughlin,** president of the Central Louisiana Electric Co, president for the coming year.

E. L. Gerber, formerly manager of development for Atlantic City Electric Co, has been named assistant to the president.

William F. O'Hara, a Scranton, Pa., attorney has been appointed a member of the Pennsylvania Public Utility Commission.

Philadelphia Electric Co has appointed **Edward J. Cave** general supervisor of its Customers Service department.

F. C. Weiss, vice president of engineering and construction for the Alabama Power Co, has retired.

L. B. Locklin, formerly superintendent of production for Georgia Power Co, has been named manager of the newly created production department. **Comer C. Warren, Sr.,** has been named assistant system operator, and **M. S. Causey,** chief load dispatcher.

R. W. Neel has been named assistant manager of the Electric Sales Dept, at Cincinnati Gas & Electric Co. He succeeds **Frank E. Wiatt** who has retired.

N. Bernard Gussett, president of the Iowa Power & Light Co, has been elected a director of the Maytag Co.

Andre Dufresne has become chief engineer of the Shops and Transportation Dept of Quebec Hydro-Electric Commission. **Roch Gohier** has been named director, sales and service, with jurisdiction over the Industrial Sales Dept and the Service Dept.

Dean H. Mitchell, and **J. Samuel Hartt,** have been re-elected directors of Northern Indiana Public Service Co. Mitchell is president of the utility, and Hartt is president of Middle West Service Co.

Larry D. Brumit has been named comptroller of Florida Power Corp.

L. M. Patterson has been appointed to a newly created position as manager of headquarters sales departments for the Westinghouse Electric Corp's apparatus division. **C. E. Hammond** succeeds Patterson in his position as manager of the division's industrial sales department.

Howard B. Maquire, general manager of sales for American Steel & Wire Division, U. S. Steel Corp, retired on April 1.

OBITUARY

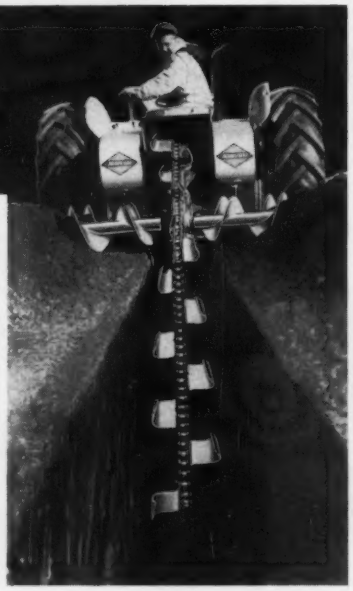
Harold F. Sanders, 53, vice president, treasurer and secretary of the Middle South Utilities Inc, died April 14 of a heart attack.

Allen N. Cartwright, 77, retired vice president and director of West Penn Power Co died April 11. He had retired in 1949 after 46 years with the power company.

Paul H. Robbins, superintendent of engineering for the Metropolitan Edison Co died recently at the age of 60.

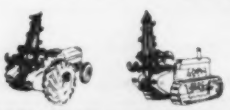
C. E. Steinfort, 75, retired vice president in charge of the Lincoln Division of the Central Illinois Electric & Gas Co, died recently.

CUT THE COST OF DITCHING WITH AUBURN TRENCHERS



You get more trench for your money – day in and day out – and at less cost with an **Auburn.** Thousands of **Auburn** owners have proved it. The Auburn has low initial cost. It's virtually trouble-free; works in soil where others can't; and, it requires only one man to operate it. The **Auburn** is rugged, but simple in design. It has fewer moving parts, less chance to break down. A unique, variable speed drive automatically adjusts the speed to changing soil conditions, and it will dig up to 800 feet per hour. Trenches from 6 to 14 inches wide and down to 6 feet. Special bits are available for rock, shale, or frozen ground.

Auburn is the world's largest producers of trenchers.



AUBURN GEAR-DRAULIC

Tractor-mounted trenchers are available for M-F Work Bulls, IH Utility, John Deere Crawler and Wheel Industrial, and Ford Tractors.

Jeep-A-Trench GEAR-DRAULIC

the original Jeep-mounted trencher, and only trencher approved by Willys Motors. Available at Jeep Dealers.

WRITE FOR COMPLETE INFORMATION and DEALER'S NAME

AUBURN MACHINE WORKS, INC. AUBURN, NEBRASKA, U.S.A.

Industry Leaders Set Goals at SEE (*Continued from page* 49)

20 years and has published six reports on its work. This activity has resulted in savings of millions of dollars to the utility industry by the development of industry standards which make for more economical production, stocking, and installation of distribution transformers. There are many other items, such as generators, regulators, switchgear, watt-hour meters, pole line hardware, etc., which have also been standardized by NEMA in cooperation with the utility industry. These likewise have resulted in enormous savings through the years. This type of standardization is continuing and benefits everyone, for it enlarges the scope of the entire electrical industry. . ."

GE Will Develop BWR As Most Promising

FRANCIS K. McCUNE, V. P., Atomic Market Development, General Electric Co.

"The action we must take, as I see it, has two objectives. One, relatively short range and that is to achieve economically competitive power in the United States, and the second, more long range, to select new concepts for future development. . . .

"The means of attaining the technical objectives are not new, and have been tried and proved in other major technical areas. The sequence of major elements making up this 'Learn and Apply' are as follows:

"The first step is research and exploratory development to lay the technical foundation for improvements which must be made.

"The second step is engineering development and testing in direct support of specific plant designs.

"The third step is plant construction—the designing and building of a series of plants to reduce to practice, to demonstrate, and to exploit the technical improvements.

"The fourth step is operational improvement. In the operations of these plants, we will obtain the kinds of information that only actual operating experience gives. . . ."

"The GE plan calls for development of the boiling water reactor as the most promising reactor type. We believe that this concept meets the criteria which warrant its selection for concentrated development. . . ."

Sees Preferred Stocks Tending to Retirement

DONAD C. COOK, Exec. V. P., American Electric Power Service Corp.

"In my opinion, the objective should be to achieve, eventually, a capital structure of about 55% mortgage bonds, 10% unsecured debentures and 35% common equity. Hence, at some stage in the process, existing preferred stocks will have to be retired or, as a result of growth of the total capital structure, progressively reduced to relative insignificance. . . .

"Buyers of bonds these days are mostly institutional in character. Their sophistication as investment analysts should be a significant consideration. In any event, a four-security structure can hardly be described as one difficult to analyze. Anyone who can analyze a three-security structure can certainly cope with one having an additional issue, particularly when each class has straightforward priorities, preferences, or other rights. Certainly any regulatory body can do so. Its conclusion therefore should be that in this industry, based as it is on a rate of return concept and hence having great inherent stability, all of the several securities are suitable for issuance."

Favors Higher Debt Ratios For Utility Company Bonds

MATT L. McWHORTER, Chairman Georgia Public Service Commission

"In view of the practically default-proof record of operating utility bonds in this century a debt ratio for an electric company of between 60 and 65% of the total capitalization should not be disturbing pro-

(*Continued on page* 102)

LABORATORY CONTROLLED...

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

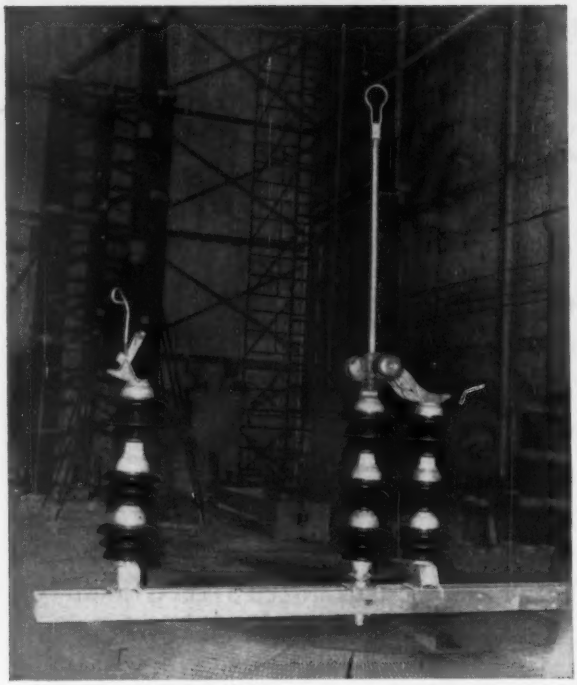
The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

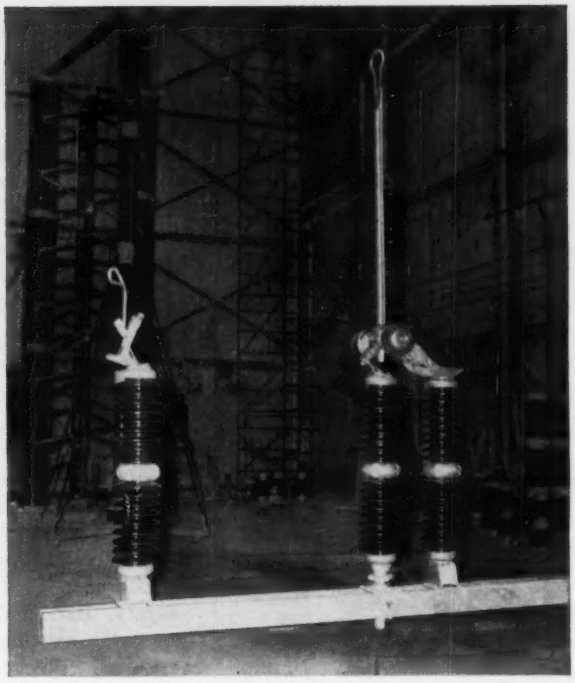
Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana



138kv Delta-Star MK-40 Switch with cap-and-pin-type insulators, set up for impulse test. Results shown in accompanying table.



138kv Delta-Star MK-40 Switch with station-post-type insulators, set up for identical impulse test. Results shown in accompanying table.

Lab tests prove Delta-Star Switches exceed NEMA safety requirements

- **Safe for positive impulse flashover**
- **Safe for negative impulse flashover**
- **Safe with cap-and-pin insulators**
- **Safe with station-post insulators**

High-voltage impulse tests on Delta-Star Switches prove that, *regardless of the type of insulators used,* all Delta-Star Switches exceed NEMA, AIEE, and EEI safety-factor requirements. Actual test results on a typical Delta-Star Switch, equipped with both cap-and-pin and station-post insulators, are given here.

Actual test values, not published values, used to determine flashover characteristics, prove Delta-Star Switches safe under *all* conditions. These tests indicate that the switches exceed NEMA requirement of 10% safety factor with both types of insulators. DELTA-STAR *GUARANTEES* SAFETY—BY TEST.

For additional information call or write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois.*

IMPULSE TEST ON 138kv MK-40 SWITCH

SWITCH POSITION	WAVE	CAP-&-PIN INSULATORS	STATION-POST INSULATORS
Insulator flashover; Contact energized	positive	725kv	766kv
	negative	972kv	1082kv
Insulator flashover; Hinge energized	positive	722kv	776kv
	negative	871kv	1074kv
Switch open; Gap flashover	positive	924kv	974kv
	negative	1191kv	1224kv
Safety Factor	positive	27.5%	25.5%
	negative	22.5%	13.1%

DELTA-STAR PORTER ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

DIVISIONS: Connors Steel, Delta-Star Electric, Disston, Forge and Fittings, Leschen Wire Rope, Mouldings, National Electric, Refractories, Riverside-Alloy Metal, Thermoid, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

TOUGH TO KNOCK OUT

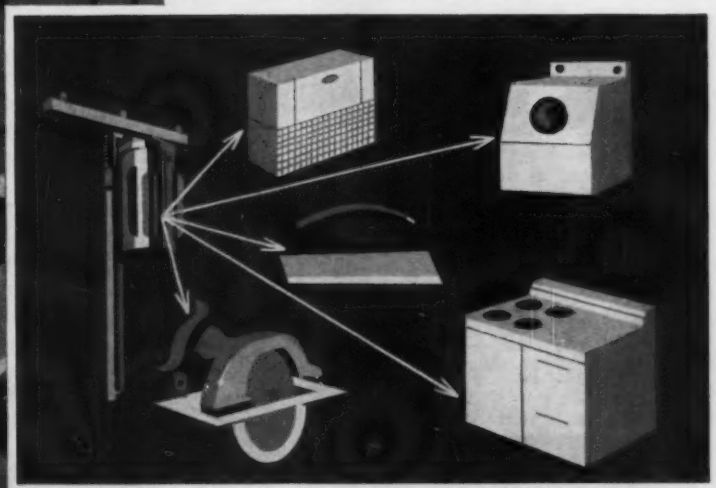
Delta-Star OSP* Transformers

Service interruptions are virtually eliminated in Delta-Star Overall Self-Protected Distribution Transformers. They offer the most modern and proven methods of protection against surges, shorts, and overloads.

Built in strict accordance with EEI-NEMA standards, OSP's assure maximum continuity of service through famous Delta-Star "Crystal Valve" arresters, rugged low-voltage breaker, and co-ordinated protective fuse. Overload signal light and external breaker-reset handle pinpoint trouble spots and speed restoration of service.

For complete specifications, call your nearest Delta-Star District office, or write *Delta-Star Electric Division, H. K. Porter Company, Inc., 17th & Cambria Sts., Philadelphia 32, Pa.*

*OSP means Overall Self-Protected

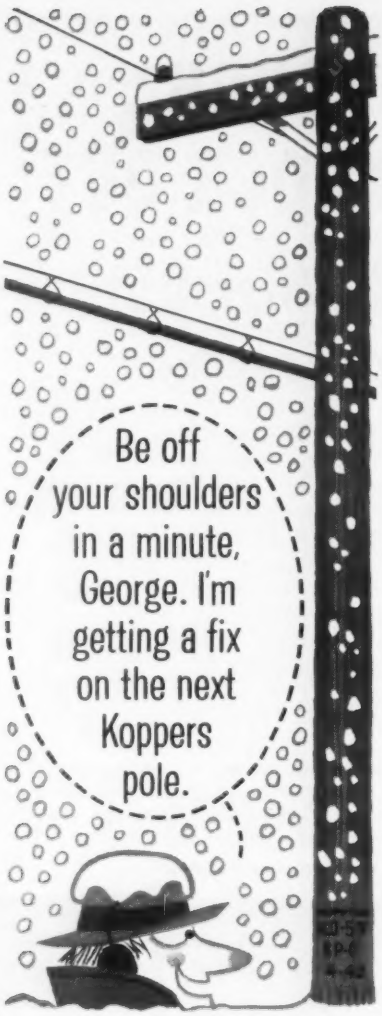


Delta-Star OSP transformers provide maximum service continuity as power demands increase through modern electrical living.

DELTA-STAR **PORTER** ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

HERE'S HOW PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.



C-32

CALL ON
KOPPERS
for rail or truck deliveries of POLES and CROSSARMS from plants and delivery yards
OFFICES IN PRINCIPAL CITIES
WOOD PRESERVING DIVISION
KOPPERS COMPANY, INC.
Pittsburgh 19, Pennsylvania

vided that this debt were subject to a reasonable amortization and such other technical provisions as would serve to reassure the bondholder. The amortization provisions should off-set in the minds of investors the minor degree of extra risk which might be created by the higher debt ratios. Such a structure would not provide much room for preferred stocks. But in view of the historic trend of this type of security and its recent experience on the market I doubt that its absence would be long mourned. It should also be noted that the income tax savings incident to high debt ratios serve not only as additional protection, but also enhance the earnings of equity securities. . . ."

Puts Aluminum Plant Use At 75 Billion Kwhr in 1968

C. H. BARTLETT, V. P., Westinghouse Electric Corp.

"We feel a reasonably attainable objective for the sale of power to the mineral industry would be 57 billion kwhr by 1963, and 69 billion by 1968. . . .

"As for total kwhr consumption by the steel industry we see it this way . . . 1958, 33 billion kwhr; our objective in 1963, 58 billion; 1968, 73 billion. . . .

"The aluminum industry offers many exciting possibilities for growth because this industry has done a fine job of aggressive selling. In terms of kwhr consumed, our objective with the aluminum industry should be 58 billion in 1963, and 75 billion in 1968; this is against 32 billion in 1958.

"By 1963, we feel the industrial air conditioning load can be 45 million kwhr and by 1968 an impressive 67 billion.

For the machinery industry, due primarily to electromation, we believe the present 17 billion kwhr load can be increased to 23 billion in 1963 and 28 billion kwhr in 1968.

Now these predicted loads for the industrial market can materialize and probably will . . . provided our industry makes an effort to bring them about. . . ."

Electric Space Heating Is Prime Sales Goal

E. O. GEORGE, V. P., Detroit Edison Co.

"In 1948 the potential dryer market was fabulous, with only 175,000 homes equipped with any kind of dryer, gas or electric. During that year we outsold gas 5 to 1 . . . today we are outselling gas only about 2 to 1 . . . and in many large metropolitan areas, where gas competition is greatest, we are actually being outsold!

"In 1948 there were three gas water heater sales to every two electric. Today this ratio has grown to more than six gas for every 2 electric. . . .

"We cannot double kwhr use during the next ten years without aggressive promotion of electric space heating. . . .

"We must adopt the marketing concept in utility operations. This means analyzing the customer point of view, smarter sales programming blending company objectives with consumer wants and competitive selling based on cold, hard facts—not just hunches and opinions. . . ."

Use All Public Relations Tools, Utilities Are Told

SHERMAN R. KNAPP, Pres., Connecticut L & P Co.

"In our business, our customer contacts are limited to a periodic bill, meter readings, and trouble calls. Our positives, in services rendered, are taken for granted. Only

our negatives are noticed, and most of us are better known locally for our sins than for our virtues.

"In this situation, and in this business, a utility company needs all the public relations principles and techniques it can command to create a true corporate image. Advertising and the honest press relations that produce favorable publicity can do a great deal; particularly because corporate advertising, featuring service standards, works internally, too. It arouses pride in employees and sets goals for their attitudes and the performance of their duties.

"But advertising is only what the Chinese call a paper tiger unless it is backed up by corporate accomplishment. To paraphrase Emerson, 'What you are speaks so loud I cannot hear what you say.' You cannot have good public relations without good works. The best copywriter cannot deodorize poor management, or poor service. And a power company's limited personal access to its customers and the public make it vital that all employees have proper education and leadership. So that, from the president to the junior clerk in the farthest office, they all understand that THEY are the company when they talk to a customer—or any citizen. For a company's corporate image, like that of Rodney Q. Gallup, is very visible in its people. In the way they look and the way they act. . . .

"Our corporate images can help in the recognition of our public problems, but they cannot resolve them. Nothing can take the place of plain, hard, person-to-person work when the town committees, the State Legislature, or the Congress are in session. . . .

"Our public picture can win support for our beliefs, *but it cannot initiate action.* Whatever action we want, commercial or political, we will have to handle it ourselves.

"This means hard work on the part of everyone in the company. It means thumbs on doorbells, and personal conversations on a people-to-people basis. It means getting to know town officials. It means getting the civic leaders to know you, and to understand the company problems in its handcuffed relationship to the community. It means encouraging company people to take a more active part in town and state politics, regardless of party. Their choice of party is their business, as Americans. The important thing is that they accept their responsibility as special citizens, and do their duty as members of the many committees, boards, and commissions. Their performance adds luster to our name, too. Political activity is really more important than political party. After all, we serve all the people in our areas, and we are owned by people of all ranks, faiths, and beliefs. . . ."

Says Alabamans Back Private Hydro Project

W. BOULDIN, Pres., Alabama Power Co.

"The completion of all these developments on the Coosa-Alabama-Warrior-Tombigbee River systems will provide 627,000 kw of new hydro capacity and 1,043 miles of modern navigable waterways, which will connect the great industrial areas of Gadsden and Birmingham and the capital city of Montgomery to the sea and will provide industrial sites and water in plenty throughout the entire 1,043 miles of river valley. Of geat importance in this picture is the fact that the Warrior River flows through the Warrior coal fields, in which there are many billions of tons of recoverable coal. This means that low-cost fuel and low-cost energy are insured for the Gulf Coast. . . .

"The aspect of this development which seems to me to be of great significance to our industry generally is the willingness of the people of Alabama to entrust our company with the responsibility for such a great share in the development of these streams. On October 29, 1953, the Coosa-Alabama Rivers Improvement Association passed a resolution asking our company to undertake the development of the Coosa River. As soon as the company's willingness to undertake such development was known, we were deluged with resolutions from organizations all over the State urging us to proceed. There were hundreds of telegrams and letters from individuals to the same effect. There was no real dissenting voice in the State except a very few landowners whose lands were involved. . . ."

A TREE TRIMMING PROBLEM SOLVED

By spinning this three conductor cable . . . .

The utility company that installed the distribution line in this photo had permission to go through this forest of great old evergreens, if they did not cut, trim, or damage the trees. After investigating all types of line construction they found that field spun cable was the best solution to their problem. Using cable and spinning it in the field, they were able to put up this three conductor distribution line to everyone's satisfaction, *at a cost less than any other type construction.* For information on field spun cable, write to address below.

CABLE SPINNING EQUIPMENT CO.

3100 Topeka Avenue Topeka, Kansas

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** :EQUIPMENT :USED OR RESALE

DISPLAYED RATE: ———RATES——— **UNDISPLAYED RATE:**

EMPLOYMENT OPPORTUNITIES: $22.67 per inch. Subject to Agency Commission.

EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission. ON ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

TRANSFORMERS

4—2500 KVA W-H 38000/66000Y-2400/4800/11000

3—500 KVA W-H 13200-2300/4000Y

3—500 KVA W-H 7200-2400/4160Y

3—400 KVA W-H 11500-2400/4800

3—333 KVA W-H 67000-480

3—333 KVA W-H 2400-120/208Y

6—167 KVA G-E 7200-2400/4160Y

6—150 KVA G-E 7200-240/480

1—750/938 KVA G-E 3-Ph. 33000-6900Y TCUL equip. fan cooling

1—1000 KVA W-H 3-Ph. 33000-7200Y TCUL equip.

1—2000 KVA W-H 3-Ph. 13800-2400

1—1500 KVA W-H 3-Ph. 13200-480

THE ELECTRIC SERVICE CO.

5331 HETZEL STREET

CINCINNATI 27, OHIO

45 Years' Dependable Service

USED LINE MATERIAL TRANSFORMERS

150 KVA 60 CYCLE SINGLE PHASE. VOLTAGE 2400/4800/8320Y-120/240. SERIALS 952912—913—914.

ELECTRIC MOTOR SERVICE

CANAAN, N. Y.

ELECTRICAL ENGINEER

To design & prepare plans, specs & estimates of cost for constr or maint of elec systems for Dept of Pub Wks. Accred degree in elec engrg: 3 yrs fld & ofc exper. $5856—$6952 annually: sound pension system incl soc security: lib. pd holdy & vac. Apply before 4 P.M., May 25, 1959.

MILWAUKEE COUNTY CIVIL SERV. COMM., Room 206, Courthouse, Milwaukee 3, Wis.

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. BOX 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

SELLING OPPORTUNITY OFFERED

Representative wanted for manufacturer of street lighting equipment, pole line specialties. Full particulars. RW-9821, Electrical World.

DON'T FORGET

the box number when answering advertisements. It is the only way we can identify the advertiser to whom you are writing.

For Additional Information

About Classified Advertising

Contact The McGraw-Hill Office Nearest You

ATLANTA, 3
1301 Rhodes Haverty Bldg. *JAckson 3-6951*
R. POWELL

BOSTON, 16
350 Park Square *HUbbard 2-7160*
D. J. CASSIDY

CHICAGO, 11
520 No. Michigan Ave. *MOhawk 4-5800*
W. HIGGENS D. C. JACKMAN

CLEVELAND, 13
1164 Illuminating Bldg. *SUperior 1-7000*
W. B. SULLIVAN T. H. HUNTER

DALLAS, 2
1712 Commerce St., Vaughn Bldg. *RIverside 7-5117*
GORDON JONES F. E. HOLLAND

DETROIT, 26
856 Penobscot Bldg. *WOodward 2-1793*
D. M. WATSON

LOS ANGELES, 17
1125 W. 6 St. *HUntley 2-5450*
P. M. BUTTS

NEW YORK, 36
500 Fifth Ave. *OXford 5-5959*
H. T. BUCHANAN R. P. LAWLESS

PHILADELPHIA, 3
Six Penn Center Plaza *LOcust 8-4330*
H. W. BOZARTH T. W. McCLUSKY

ST. LOUIS, 8
3615 Olive St. *JEfferson 5-4867*

SAN FRANCISCO, 4
68 Post St. *DOuglas 2-4600*
S. HUBBARD

Soviets Tell Power Progress

(*Continued from page 53*)

Q. *What cable voltages are in use in Russia?*

A. Our cable systems are somewhat limited. Our highest cable operating voltage is 110 kv. The installation is in Moscow. We used cable principally where it is difficult to get power away from a station by overhead means. The 110-kv cable is of the low-pressure, oil-filled, paper-insulated type. A pipe cable has been developed but is not in use.

Q. *What is the average size of steam power plants now operating in the USSR?*

A. Our typical modern steam station today ranges from 600 to 1,200 Mw. While we do not use outdoor or semi-outdoor stations, we are making considerable use of prefabricated concrete block and panel construction to reduce station cost. Two of our plants in the south and west are completely built from precast concrete blocks and wall panels. These plants, which are in effect "assembled" rather than built in the field, house 400 to 600 Mw of capacity.

Q. *What is the order of size of steam turbine-generators being installed on the Russian power system today?*

A. Units of 100 and 150 Mw are the standard size being installed. There are more than 100 units of the 100-Mw size in operation. A 200-Mw, single-shaft unit has been manufactured and is being installed. A 300-Mw unit has been designed and is now being manufactured.

Q. *What is the order of steam pressure and temperature for these units?*

A. Present 150-Mw units operate on steam at 2,500 psi, 1050F. The 200-Mw unit is designed for 3,000 psi, 1085F.

Q. *What type of cooling is used with the generators?*

A. The standard 100 and 150-Mw machines are hydrogen cooled at 1.2 atmos. The 200-Mw machine uses direct hydrogen cooled rotor and stator, but the projected 300-Mw machine will use inner cooling of rotor and stator. An experimental 30-Mw unit is being used to explore water and oil cooling of generator stators.

PROFESSIONAL SERVICES

AMERICAN AIR SURVEYS, INC.

- Aerial Topographic Maps & Photos
- Plan & Profile for Transmission Lines
- Aerial Stereo-photos for Planning
- Topographic Maps for Reservoir Studies
- Coal Stockpile Volumes by Aerial Method

Reps.—Chicago-Huntington, W. Va.

907 Penn Avenue — Pittsburgh 23, Pa.

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Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

11 Park Place, New York City
36 State Street, Albany, N. Y.

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Consulting Engineers

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Investigations, Valuations and Rates

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Steel Tower & Wood
Transmission Lines

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Construction • Electric, Steam, Hydro Plants
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160 West Broadway • New York 13, N. Y.

COMMONWEALTH SERVICES INC. | ASSOCIATES INC.

Management and Business Consultants
300 Park Ave.
New York 22, N. Y.

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Jackson, Michigan

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Electrical Insulation Engineers

Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications

Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr., Chicago, Ill.

ELECTRICAL TESTING LABORATORIES, INC.

Electrical, Electronic, Environmental, Photometric and Chemical Laboratories. Testing, Research, Inspection and Certification.

2 East End Ave. — New York 21, N. Y.

READERS MAY CONTACT

the consultants whose cards appear on this page with the confidence justified by the offering of these special services NATIONALLY.

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1333 North Second Street — Abilene, Texas

UTILITIES LINE CONSTRUCTION COMPANY, INC.

Construction and Maintenance

Transmission - Distribution
Electric and Telephone Lines
Consultants

505 York Road — Jenkintown, Pa.

VERNON GRAPHICS, INC. | VERNON GRAPHICS OF PA. INC.

CONSULTING AND SERVICING UTILITIES ON MAPS, RECORDS AND FIELD INVENTORY

Mount Vernon, N. Y. MO 4-7117 | Norristown, Pa. Broadway 9-3000

THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals

80 Broad Street, New York 4

The Meetings Calendar

MAY

• **Air Conditioning & Refrigeration Institute**—Board and Annual Meeting, The Homestead, Hot Springs, Va., May 3-6.

• **International Electrochemical Meeting** — Electrochemical Society, Sheraton Hotel, Philadelphia, Pa., May 3-7.

• **American Society of Mechanical Engineers**—Maintenance and Plant Engineering National Conference, Edgewater Beach Hotel, Chicago, Ill., May 4-5; National Production Engineering Conference, Statler Hilton Hotel, Detroit, Mich., May 12-14.

• **Industrial Control System Components Conference** — Co-sponsored by School of Electrical Engineering of Purdue University and Control Engineering Magazine, Purdue University, Lafayette, Ind., May 4-5.

Pennsylvania Electric Association—System Planning Committee, Mountain View Hotel, Greensburg, Pa., May 4-5; Electrical Equipment and Industrial Sales Conference, Bedford Springs, Pa., May 7-8; 10th Annual Customer Relations Conference, Hershey, Pa., May 13; Accident Prevention Committee, Bedford Springs, May 14-15; Systems Operation Committee, Galen Hall, Wernersville, Pa., May 14-15.

Edison Electric Institute—Prime Movers Committee, Palmer House, Chicago, Ill., May 4-6; Purchasing and Stores Annual Meeting, Hotel Soreno, St. Petersburg, Fla., May 4-6; Industrial Relations Committee joint with Personnel Committee of the Ohio Electric Institute, Netherlands Hilton Hotel, Cincinnati, Ohio, May 7-8; Transmission & Distribution Committee, Shoreham Hotel, Washington, D. C., May 7-8; Electrical System & Equipment Committee, Roosevelt Hotel, Pittsburgh, Pa., May 25-26.

Institute of Radio Engineers—National Aeronautical Electric Conference, Biltmore Hotel, Dayton, Ohio, May 4-6; Electronic Components Conference, Benjamin Franklin Hotel, Philadelphia, Pa., May 6-8; Seventh Regional Technical Conference & Trade Show, University of New Mexico, Albuquerque, N. M., May 6-8.

• **American Society of Civil Engineers**—Cleveland Convention, Cleveland, Ohio, May 4-8.

• **Public Utilities Advertising Association**—Annual Convention, Sheraton Hotel, Dallas, Texas., May 6-8.

• **Electrical Manufacturers Representatives Association of Michigan**—1959 Electrical Exhibit, Detroit Artillery Armory, Detroit, Mich., May 6-8.

• **Second Annual Joint Conference on Automatic Techniques**—Sponsored jointly by ASME, AIEE, IRE, Pick Congress Hotel, Chicago, Ill., May 11-13.

• **Instrument Society of America**—Second Annual Power Conference, President Hotel, Kansas City, Mo., May 11-13.

• **Hydraulic Power Committee**—Arrowhead Lodge, Lake Ozark, Mo., May 11-13.

• **National Electrical Manufacturers Assn**—ASTE Subcommittee on Electrical Insulation Materials, NEMA Office, May 13; EEI-NEMA Subcommittee on Standards for Underground and Network Transformers, Edison Electric Institute, New York City, May 14-15.

• **Kansas Farm Electrification Council**—Fourth Annual Conference, Kansas Gas & Electric Co's Auditorium, Wichita, Kansas, May 13.

• **New Jersey Utilities Assn**—Spring Meeting, Seaview Country Club, Absecon, N. J., May 13-15.

• **Symposium on the Nuclear Power Plant**—Sponsored by the AIEE and the University of Vermont, Burlington, Vt., May 14-15.

• **National Industrial Service Association**—International Convention, Hotel Queen Elizabeth, Montreal, Quebec, Canada, May 17-20.

• **Industrial Heating Equipment Assn**—Spring Meeting, The Homestead, Hot Springs, Va., May 17-20.

• **Northwest Electric Light & Power Association**—Business Development Section, Multnomah Hotel, Portland, Ore., May 18-19.

• **Fifth National Symposium on Instrumental Methods of Analysis**—Sponsored by the Instrument Society of America, Hotel Shamrock Hilton, Houston, Tex., May 18-20.

• Additions this week.

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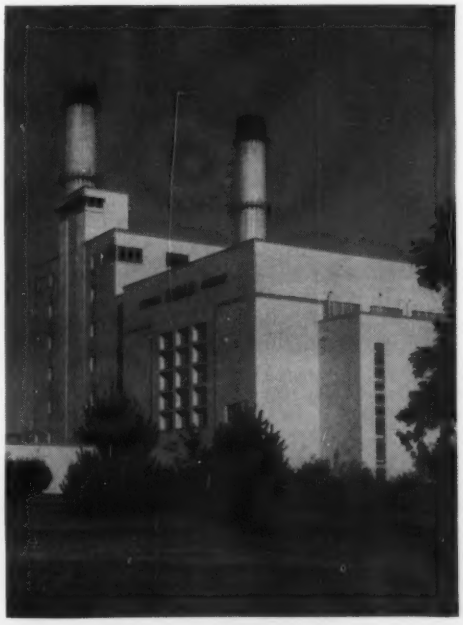

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